NASA CONTRACTOR REPORT



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NUMERICAL ANALYSIS OF STIFFENED SHELLS OF REVOLUTION

Volume V of VII

by V. Svalbonas and P. Ogilvie

Prepared by
GRUMMAN AEROSPACE CORPORATION
Bethpage, N.Y. 11714
for George C. Marshall Space Flight Center

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16.	ABSTRACT				
	This manual contains	engineering pr	ogramming informa	tion for the S	TARS-2B
	(Shell Theory Automated for	Rotational St	ructures -2B (Buc	kling)) digita	1 computer
	program. The report is wri	tten for the e	ngineer who will	need to make s	mall
	alterations to the program, table size, to fit his spec	ific needs T	porating a new ge	ometry, or alt	ering a
	major subroutine. These se	ctions are fur	her subdivided i	n the followin	cover one
	where applicable:	corono die idi	ther subdivided i	n the lollowin	g mainter
	••				
	A. Subroutine descr	iption.	•	•• .	
	B. A list of perting counterparts.	ent engineerin	g symbols and the	ir FORTRAN cod	ed `
	C. Subroutine flow	chart.			•
	D. Subroutine FORTR	AN listing			
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- VOLUME II. Users' Manual for STARS-2S Shell Theory Automated for Rotational Structures 2 (Statics), Digital Computer Program
- VOLUME III. Users' Manual for STARS-2B, 2V Shell Theory Automated for Rotational Structures 2 (Buckling, Vibrations), Digital Computer Programs
- VOLUME IV. Engineer's Program Manual for STARS-2S Shell Theory
 Automated for Rotational Structures 2 (Statics), Digital
 Computer Program
- VOLUME V. Engineer's Program Manual for STARS-2B Shell Theory
 Automated for Rotational Structures -2 (Buckling), Digital
 Computer Program
- VOLUME VI. Engineer's Program Manual for STARS-2V Shell Theory Automated for Rotational Structures -2 (Vibration), Digital Computer Program
- VOLUME VII. Satellite Programs for the STARS System

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The authors wish to acknowledge the overall aid of Mr. J. Key, especially in the debugging phases of the UNIVAC program version.

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INTRODUCTION

This manual presents a general description of the STARS-2B digital computer program. FORTRAN IV is used exclusively in writing the various subroutines. The execution of this program requires the use of eleven temporary storage units.

The program was initially written and debugged on the IBM 370-165 computer and then converted to the UNIVAC 1108 computer, where it utilizes approximately 46,000 words of core. Only basic FORTRAN Library routines are required by the program, these being: sine, cosine, absolute value, square root, min 0, max 0, amax 1, amin 1, and random.

For ease and speed in usage, the Table of Contents on the following page has also been laid out to present the call sequence of the program.

CONTENTS

CALL SEQUENCE	CALLING ROUTINE	PAGE
MATR		
MAIN		1
RIEMAN	MAIN	9
· SETUP · ·	RIEMAN	23
MAGIC	RIEMAN	23
ROBOT	RIEMAN	27
GEOMET	ROBOT	27
PLICO	GEOMET	27
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SWITCH	REGMAT	68
CHASE	REGMAT	68
FUTILE	CHASE	68
TRIEQ	CHASE	68
STRMAT	MAIN	91
RINGER	STRMAT	85
FLEX	STRMAT	91
INITAL	MAIN	102
LEBEGE	MAIN	109
FIXEM	LEBEGE	109
WAND	LEBEGE	109
TOBAR	LEBEGE	109
TEMOEG	TOBAR	109
PLYCO	TEMOEG	109
PLYNE	TEMOEG	109

SEQUENCE	CALLING ROUTINE	PAGE
		· · · · · · · · · · · · · · · · · · ·
ODEL	LEBEGE	135
ODES	LEBEGE	135
EIGVAL	MAIN	147
COMPAK	EIGVAL	147
EIGEN	EIGVAL	151
FUTILE	EIGEN	68
DAGGER	EIGEN	151
SWITCH	EIGEN	68
SYMEIG	EIGEN	151
TFORM	SYMEIG	151
STURM	SYMEIG	151
PREP	STURM	151
DET	STURM	151
SYMVEC	EIGEN	151
QSVEC	SYM V EC	151
QWIEL	SYMVEC	151
RANDO	M QWIEL	151
ANDD	QWIEL	151
DOTPR	QWIEL	151
TRIEQ	EIGEN	68
DETERM	MAIN	165
DET2	DETERM	165
DCOMP2	DET2	165
SUPER	DCOMP2	165
BCVECT	MAIN	172
ETRAP	MAIN	175
•		

SUBROUTINE MAIN

MAIN is the control link for the entire program. Sizing values are read into the program, as well as information for eigenvalue or determinant accuracy calculations, and the material property tables. Calls are made to subroutines RIEMAN and SEGMAT once for each segment in a region; then subroutine REGMAT is called. This procedure is executed once for every region in the structure. Finally a call to subroutine STRMAT is made. If the clues are set for the program to calculate the prestress state, subroutines INITAL and LEBEGE are called. Otherwise the control link loops back and resets the clues for the calculation of nonlinear stiffness matrices.

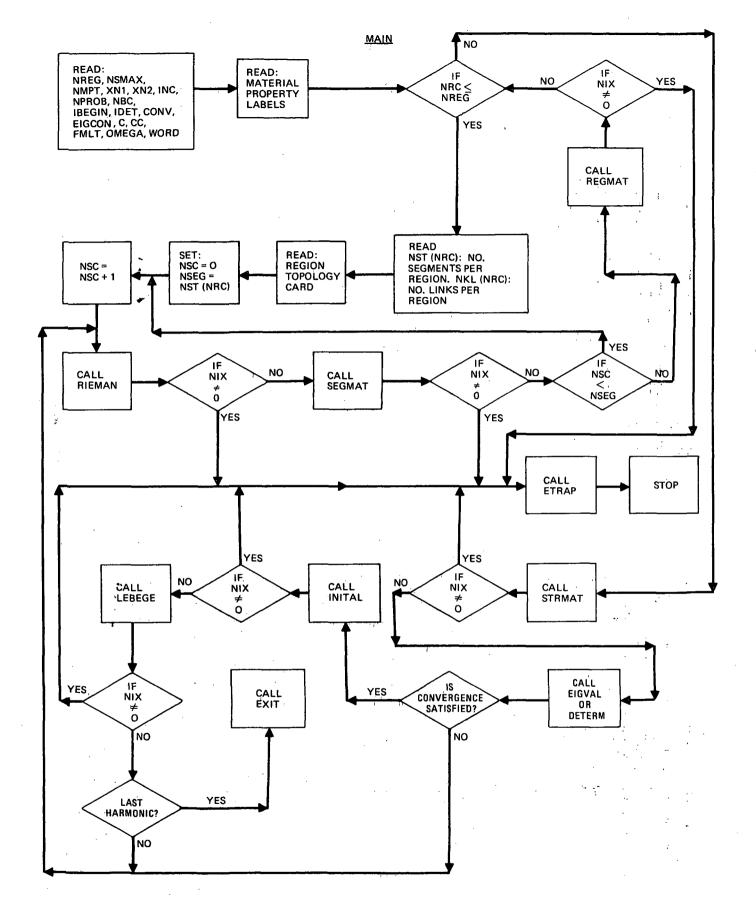
In the calculation loop for the nonlinear stiffness matrices the program proceeds as above to STRMAT. Next EIGVAL or DETERM are called to calculate eigenvalues or evaluate a determinant as per user input. If these calculations satisfy convergence criteria, subroutines BCVECT, INITAL, and LEBEGE are called. If convegence criteria are not satisfied the program will loop until satisfaction is obtained.

In a multi-harmonic eigenvalue search the whole procedure loops on the harmonic number.

There are also several counters in this control link. These are defined as follows:

- NSC Counts the calls to subroutines RIEMAN and SEGMAT, from 1 to the number of segments within a region.
- NRC Counts the calls to subroutine REGMAT, from 1 to the number of regions in the structure.
- ICYC Cycle counter (counts harmonics).
- NPASS Pass counter (counts passes necessary to converge in a single harmonic).

The block data and overlay listings are included in this section.



** ABACUS UPDATED 07/01/72
COMMON /NAM1/ FACE(4),STRG0(7),THERM(4),MATER(3),SEGTAB(12)
-DATA STRGØ /11.0,13.0,21.0,31.0,12.0,14.0,15.0/
DATA THERM /4HTHST,4HNØTH,4HTHCN,4HTHIN/
DATA MATER /4HISØT,4MØRTH,4HSTIF/
DATA SEGTAB/4HST10,4HTHIC,4HRWAF,4HRWA1,4HRWA2,4HRWA3,4HISG1,
4HISG2,4HISG3,4HST11,4HST12,4HST13/
DATA FACE /4HSING,4HEQUA,4HUNEQ,4HBLAN/
COMMON TWINTER/INDICS
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C RØUTINE **D2 ** ABACUS UPDATED 07/25/72 RØUTINE **D2 INTEGER XN1,XN2,XN INTEGER XN1,XN2,XN DØUBLE PRECISIØN SAVIIC,TIC,PHI,SIØP,RESTØP,RTICK DØUBLE PRECISIØN YCARR CØMMON STØRY(16),XNAT(110,10),STD(10),SADUS(30),RADUS(30) CØMMON NATOUS(30),UADUS(30),SAVIIC(900) CØMMON NATOUS(30),UADUS(30),SAVIIC(30),SAVSTP(30),JRTIC(30) CØMMON NATIGO,NKL(30),NXMAT(20),SAVJIC(30),SAVSTP(30),JRTIC(30) CØMMON NSTØP(30),NREG,NMPT,NRC,NSC,NIX,IERRØR,KGEM,IGEØM,ISTAB CØMMON NSTØP(30),NREG,NMPT,NRC,NSC,NIX,IERRØR,KGEM,IGEØM,ISTAB CØMMON NSTEVIN,IBECIN,NPRØB,NSEG,NERRØR,G,THICK,NØJS,NLINKS,NLCASE CØMMON NTSKL,NZ,NBCT,LLINPUT,NTRKL,NPASS,XNI,KBC,NRINGS CØMMON / VRCØRR/ YCØRR(80) CØMMON / ARING/ NRING(28),AMAT(30,4),IRLC(28)	WRITE(6,1726) WRITE(6,1726) 1726 FORMAT(1H1) REWIND 1 REWIND 3 REWIND 10 REWIND 10 REWIND 11 REWIND 12 REWIND 13 REWIND 14 NIX = 0 0=5 RED(5,1001,END=555) (STØRY(I),I=1,16)	FORMATI FORMATI FORMATI FORMATI FORMATI SCX, DA 321H NUM 321H NUM 321H NUM 56 D TO FORMATI FORMATI CONVINU CONVINU 117 CONTINU CONVINU 117 CONTINU CONVINU

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		201780
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200 CONTINUE		201810
	J	20182
CALL INITAL		201830
CALL LEBEGE		201840
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CONVER # CONV		201911
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60 TØ 100 555 CALL EXIT		202090
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SBBS CONTINUE: CALL ETRAP		202140
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OVERLAY

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IN NBF24\$
IN MAIN, BLDATA
SEG RIF*, KRØBT)
IN RIEMAN, SETUP, RØBØT, GEØMET, PLINE, PLICØ
SEG DF1*, (RIE)
IN DIF!
SEG DF2*, (RIE)

IN DIFF2 SEG SGMAT*, (RØØT)

IN 0DE1 SEG 0D2*,(LEB) IN 0DE2 SEG TRAP*,(R02T) IN ETRAP

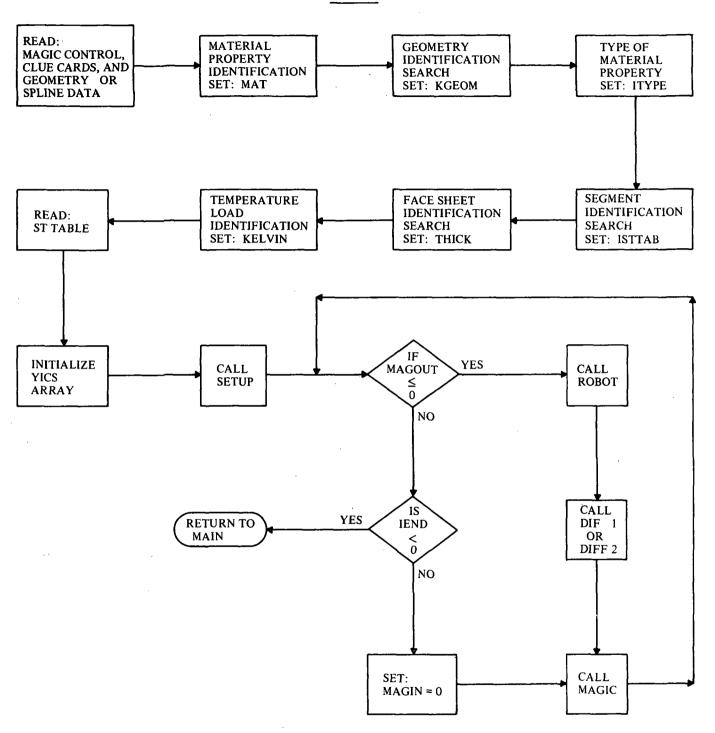
SUBROUTINE RIEMAN

This subroutine link assembles the data tables for use in the integration procedure. The program has the capability of handling 2 loading conditions (dead and live). Temperature load can be included in either one, but not both.

The subprogram link, RIEMAN, utilizes the subroutines SETUP, ROBOT, DIF1 or DIFF2, to integrate the differential equations of each segment independently, under arbitrary load conditions. The results of the integrations of each segment are stored in the YCORR array in RIEMAN, and represent the stiffness and deflection coefficients of each segment.

FORTRAN CODE	ENGINEERING SYMBOLS (REF. 1)
XFTHLD	f _θ
XFPHLD	f
XFZELD	f _ζ
XMTHLD	m _e
XMPHLD	m _φ
ETHET	E _θ
EPHI	E
XGPT	φ G _{φθ}
XNUTP	νθφ
XNUPT	νφθ
ALPHTH	αθ
ALPHPH	α_{Φ}
XNTTH	N _T θ
XNTPH	$^{ m N}{}_{ m T}{}_{ m \varphi}$
XMTTH	$^{ m M}_{ m T heta}$
XMTPH	$^{ m M}_{ m T}$ $_{ m \Phi}$
XKll	K _{ll}
XK22	к ₂₂
XD11	D ₁₁
XD22	D ₂₂
XK33	к ₃₃
XD33	D ₃₃

RIEMAN



### ABACUS UPDATED 07 SURRUTINE ##D3 *# ABACUS UPDATED 07 SURTXI = 050RTXI INTEGER SAVJTC.5AVSTP.5EGTAB, 0 .THICK.T INTEGER SAVJTC.5AVSTP.5EGTAB, 0 .THICK.T INTEGER SAVJTC.5AVSTP.5EGTAB, 0 .THICK.T DOUBLE PRECISION NUCLTA.DTIME.FPSIL.XSAVE COMMON NUCLTA.DTIME.FPSIL.XSAVE COMMON NOTED NUCLTA.DTIME.FPSIL.XSAVE COMMON NOTES OF NUCLTA.DTIME.FPSIL.XDIL.XCLE COMMON NOTES OF NUCLTA.DTIME.FPSIL.XDIL.XCLE COMMON NOTES OF NUCLTA.DTIME.FREE.FREE.TA.DTIME.FREE.FREE.TA.DTIME.FREE.FREE.TA.DTIME.FREE.FREE.TA.DTIME.FREE.FREE.TA.DTIME.FREE.FREE.TA.DTIME.FREE.FREE.FREE.FREE.FREE.FREE.FREE.FR	DATED 07/24/72 ,THICK,TYPE STØP,RESTØP,RTICK AU,STEP,TIME IL,XSAVE2,XSAVE3,FNDEL	DUT, YASAVE, YAN TH, YAMTH, YAMPT, YAJPH, S, SN, CS, SNSQ, 300120 SSQ, TAN, SEC, CC, XICS, XISN, TN, XIRB, XIRBSQ, XISNRB, 300130 ICSAB, CNIRB, SNIRB, CSIRB, XIRB, XIRS, CSIRI, CSIRZ, 300140 NIRI, XIRISQ, RZ, SQ, RB, BESQ, RBSQ, XNSQ, RI, RZ, SI, 300150 IDBT, XNTTH, XNTPH, XMTTH, XMTPH, XCII, XC2I, XC2S, XC1S, 300150 D11, XNPHI, BEFA, XC1E, XK11, XK12, XK2I, XK2Z, XK33, 300170 BAT(110,10), STD(10), SADUS(30), RADUS(30) 300190 ADUS(30), SAVIC(900) 300190 IC, PHI, STBP, RESTBP, RTICK, G1, XNL(2), NH 300210 IC, PHI, STBP, RESTBP, RTICK, G1, XNL(2), NH 300210 IC, PHI, STBP, RESTBP, RTICK, G1, XNL(2), NH 300220 IC, PHI, STBP, RESTBP, RTICK, G1, XNL(2), NH 300220 IC, PHI, STRBP, NSC, NIX, IERRBR, KGEBM, IGEBM, ISTTAB 300220 IN, NRRBB, NSEG, NERRBR, Q, THICK, NOUS, NIX, INKS, NICASE 300220 IN, NRRBB, NSEG, NIX, HERRBR, GCTBB, ISTAB 300220 IL, INPUT, NTRKL, NPASS, NI, RBC, NRINGS IL, NRING, NSC, NIX, RECARRED 300220 IL, STRGB(7), THERM(4), MATER(3), SEGTAB(12) 3002260			300570 300580
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		,4HDTAU,15X,4HDIFF	300860
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	185	WRITE(6, 186) (ZI(I), RI(I), I=1, NRZIN)	~
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IF (I.EQ.NRØW-2*NLCASE+1) WRITE(6,298)
FØRMAT(//42X,48HTABLE ØRDER PHI ØR S VS. INPUT STRESS RESULTANTS)
WRITE(6,600) (ST(I,J),J=1,NP)
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wRITE(6,654) ((XMAT(1,J),J=1,10),I=II,III)
F@RMAT(//51X,28HMATERIAL PR@PERTY TABLE USED,//(10(1H ,E12.5)))
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                                                                                                                               TEMPERATURE LØAD IDENTIFICATION
IF (SHEET.EQ.FACE(I)) G0T0 509
                                                                                                                                                       IF (RANKIN. EQ. THERM(I))GOTO 402
                                                                                                                                                                                                           LINEAR ANALYSIS IDENTIFICATION
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  DE 901 1=1,NREW
(F(Q.EQ.1) GE TE 193
READ (5,1005) (ST(I,J),J=1,NP)
FERMAT (5E14.7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     #RITE(1) (ST(I,J),J=1,NP)
IF (NH.NE.O) GØ TØ 901
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         ) (ST(I,J),J=1,NP)
                                                                                                                                                                                                                                                                                                                                                                  (ISTFAB.EQ.11) NROW = 1
                                                                                                                                                                                                                                                                                                                                                                             (ISTTAB.EQ.12) NRØW = 1
                                                                                                                                                                                                                                                                                                                                                      ISTTAB.EQ.10) NROW =
                                                                                                                                                                                                                                                                                                                                         STTAB.EQ.9) NROW =
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            IF (KBC.NE.0) GØ TØ 590
                                                                                                                                                                                                                                                                                                                            ISTTAB.EQ.8) NROW
                                                                                                                                                                                                                                                                                                               NR ON
                                                                                                                                                                                                                                                                                                                (STTAB.EQ.7)
                                                                                                                                                                                                                                                                                                                                                                                                      .= 2#(MAT-1)+1
                                                                                                                                                                                                                                                                                                                                                                                                                               I I I=NXMAT(L+1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 DØ 750 JJ=1,12
                                                                                                                                             P# 401 1=1,4
                                                                                                                                                                                                                                      VRRW = THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 HRITE(6,655)
                                                                                                                   KLUE1=THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 750 LST(JJ) = 0
                                                                                           GØ TØ 433
                                                                                                                                                                                   COTA BC9C
                                                                                                                                                                                                                        I VNLYZ = ]
                            CØTØ 8089
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 GB TB 901
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              CONTINUE
                                                                                                                                                                                               KELVIN=f
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         K = NRØW+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          CONTINUE
                                                                              KLUE2=2
                                                                                                       K.LUE2=3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            READ (1
                                        THICK=I
                                                       KLUE2=1
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MM=1
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 661 FORMAT(//16x, 8HPROBLEM ,12,5x,84HTABLE ORDER PHI OR S VS. DISTRIB
1UTED LOADS (F THETA, F PHI, F ZETA, M THETA, M PHI),)
WRITE(6,1968) (LST(J),J=JT,JTT)
968 FORMAT(27H LOAD IDENTIFICATION CLUES ,611/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      FORMAT(//45x,42HTABLE GROER PHI GR S VS. TEMPERATURE LØADS.)
                                                                                                                                                                                             IF (NLC.ST.1.AND.LST(1).NE.O.AND.LST(JT).NE.0) C0 T0 8008
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 IF (Q.EQ.1) GB TB 2004
READ (5,591) IS,SAVJTC(IS),SAVSTP(IS),(STBRY(I),I=1,16)
591 FBRMAT (315,1644)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 K = K + L - LST(JT)

(F (NLC.EQ.1.AND.LST(1).EQ.0) NRW = K-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          660 |F((L-LST(JT)).EQ.0) GW TW 665 |
IF (NH.NE.0) GW TW 665 |
WRITE(6,661) NLC
                                                                                                                                                                                                                                                                                                                     00 72 M=K KK
|F(G.EG.1) G0 T0 197
|READ (5,1005) (ST(M,J),J=1,NP)
                                                                  [F(0.EC.1) GB TB 195
[:EAD(5,1004) (LST(J),J=JJ,JJJ)
                                                                                                                                                                                                                                                                                                                                                                 (ST(M,J),J=1,NP)
                                                                                                                                                                                                                                                                                                                                                                                           ) (ST(M,1),1=1,NP)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              WRITE(6,600) (ST(N, J), J=1,NP)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        WRITE(6,600) (ST(N,J),J=1,NP)
                                                                                                                                                                                                                                                                                                                                                                                                                     IF (LST(JT).EQ.0) GB TB 660
                                                                                                              WRITE(1) (LST(J), J=JJ, JJJ)
                                                                                                                                     195 READ(1) (LST(J),J=JJ,JJJ) 196 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              K = K2+1
IF (MH.NE.0) GØ TØ 665
                                                                                                                                                              IF(LST(JJ))8031,19,20
20 L = LST(JJ)
                                                                                                                                                                                                        19 JJ=JJ+1
23 FF(LST(JJ))8031,22,21
21 L=L+1
22 IF(JJ,EG,JJJ) G0T@ 24
                                                                                                                                                                                                                                                                                            IF(L.EQ.0) GØ TØ 71
TIRW = NRAW
DØ 17 NLC=1,NLCASE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          130 662 N = K, KK
                                                                                                                                                                                                                                                                                                                                                                                                                                                               KZ = K+L.ST(1)-1
                                                                                                                                                                                                                                                                                                            KX | K + L | |
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    UB 657 N=KY, KZ
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                                                                                               FORMAT(CIL)
                                                                                                                          CØ TØ 196
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665 CONTINUE
71 K = K + L
                                        LLL =TIL
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, SAVSTP (I.S.) , STØRY , SAVSTP (I.S.) , STØRY	KBC.EQ.O) READ(13) SAVY • 7, 15, 1P6E16.7) N.MAGBUT, TIC.STEP, NEQNS, DIA **YCBRR, YDBT, YNEW, YDEV, FWDE	MAGIN, MAGOUT, TIC, STEP, NEONS, DTAU, EPSIL, DELTA, ERR, TO 1 ME, VICS, VPRED, VCORR, VDØT, VNEW, YDEV, FWDEL, TBDEL) 100 100 25 100 62 100 63 100 64 100 100 100 64 100 60 100 60 60 100 60 1
READ(5,2000) FGRMAT(1X) WRITE(1) IS,SAVJTC(IS),SAVSTP(IS),STØRY GG TG 2005 GG TT 2005 IT C = SAVJTC(IS) IT C = SAVJTC(IS) IT C = SAVSTP(IS) IT C = JRSTP(IRS) IT C = JRSTP(IRSTP) IT	(33)=1.0 (42)=1.0 (51)=1.0 (50)=1.0 =0 =0 ===NRØW ===1.0 DTAU = 0.00 NH.NE.0.AND. NH.NE.0.AND. NH.NE.0.AND. NY.NE.0.AND.	MAGIC (MAGIC (MAGIC (MAGIC (ME GT S ME GT S ME TIME C T S MINITED TIME C T S MINITED TIME C T S MINITED T S MINITED T MIN

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74 65 44	IX=Z+NIBIAL	303210
57 ST(IK	L)=S1(IK,I-1)+(S1(IK,I)-S1(IK,I-1))*(ARG-S1(I,I-1))/(S1(I,I	303220
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٥.	/(!L@W)=(SI(L,LL)+ SI(L+1,LL)+ SI(L+2,LL) + SI(L+3,LL))/4.0	303420
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IF (A	ARG-XMAT(II, [1) 121, 123, 104	303580
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104 CONTI	I NUE	9
00 10	8067	303610
123 L=11+	, 1+	362
0.6 12	22 J=L,1[[53
XLAYER(M)	R(M)=XMAT(U,I)	0364
122 M=M+1		36
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124 L=11+	- -	36

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DB 125 J=L,III
xlayer(m)=xmat(j,i-1)+(xmat(j,i)-xmat(j,i-1))*(arg-xmat(ii,i-1))/
(xmat(ii,i)-xmat(ii,i-1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        IFILTYPE .EQ.3 .AND. ISTTAB .GE. 3)GE TE 109
                                                                                                                                                                                                                                                                                                                                                                                                                           ALPHPH(IL)= ALPHTH(IL)
XGPT(IL)= ETHET(IL)/(2.0*(1.0+ XNUPT))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XNUPT = ETHET(IL) * XNUTP/EPHI(IL)
                                                                                                                                                                           xGPT(1) = ETHET(1)/(2*(1+ XNUPT))
xGPT(2) = ETHET(2)/(2*(1+ XNUPT))
                                                                                                                         GØ TØ (115,115,112,113,114),LØØP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      CM TO (417,107,108,119,118), LØBP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XNUPT = ETHET(IL) * XNUTP/EPHI(IL)
                                                                                                                                                                                                                     XNUTP = XLAYER(3)
XNUPT = ETHET(1)*XNUTP/EPHI(1)
                                                                                                                                                                                                                                                                                                                                           GØ T0(101,102,103),ITYPE
                                                                                                                                                    FIITYPE.NE. 1)GØ TØ 131
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ALPHTH(IL) = XLAYER(4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ALPHPH(IL) = XLAYER(5)
                                                                                                                                                                                                                                                                                                                                                                                   ALPHTH(IL) = XLAYER(3)
EPHI(IL) = ETHET(IL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ALPHTH(IL)= XLAYER(4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ALPHPH(IL)= XLAYER(5)
                                                                                                                                                                                                                                                                                                                                                           ETHET(IL)= XLAYER(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ETHET(1L)= XLAYER(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ETHET(IL) = XLAYER(1)
                                                                                              XLAYER(M)= XMAT(J,1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                EPHICIL) = XLAYER(2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     xGPT(IL) = XLAYER(6)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             XGPT(IL) = XLAYER(6)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ALPHR = XLAYER(9)
                                                                                                                                                                                                                                                                                                                                                                        XNUTP = XLAYER(2)
                                                                                                                                                                                                                                                                                                    ALPHR = XLAYER(9)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             XNUTP = XLAYER(3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XNUTP= XLAYER(3)
                                                                                                                                                                                                                                                                          ALPHS=XLAYER (10)
                                                                                                                                      XNUTP= XLAYER(2)
                                                                             DØ 922 J=L, III
                                                                                                                                                                                                                                                                                                                 ER = XLAYER(7)
                                                                                                                                                                                                                                                           ES= XLAYER(8)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ES =XLAYER(8)
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                                                                                                                                                                                                                                                 GØ TØ 106
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                                                        Gørø 111
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                                          125 M=M+1
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                                                                                                                                                                                                                                                                            -CALL RØBØT (ST,KLUE2,NRØW,NRW,LL,ER,ES,G2,G3,TIME,ITIC,JTIC,NCYC)
IF (NIX.NE.O) GØ TØ 9999
CØMPUTATIØN ØF K AND D FØR K AND D INPUT
                          INTGH = 4

CPH = ST(3,LL)

IF(ISTIAB.GE. 10.ANU. ISTTAB.LE. 12)CPH = ST(6,LL)

IF(CPH .LE.0)GB TØ 281

TMPAV(4) = ST(L,LL)
                                                                                                                                      CTH = ST(3,LL)
IF(ISTTAB.GE. 10.AND. ISTTAB.LE. 12)CTH = ST(7,LL)
IF(ISTTAB.GE. 0)GW IW 116
IMPAV(5) = ST(1,LL)
                                                                                                                                                                                                                                                                                                                         IF(XK11.EQ.0.0) GBTS 8101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   K = NRØW
NLCSE = NLCASE
IF (NH.EQ.O) NLCSE = 1
XFPHL1 = 0.0
                                                                                    281 TMPAV(4) =ST(L+3;LL)
SØ TØ 85
                                                                                                                                                                                    116 TMPAV(5)= ST(L+3,LL)
                                                                                                                                                                                                                  ETHET(2) = EFHET(1)
ALPHTH(2) = ALPHTH(1)
ALPHPH(2) = ALPHPH(1)
                                                                                                                                                                                                                                                XGPT(2)= XGPT(1)
EPHI(2)= EPHI(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           XMTTH = 0.0
XMTTH = 0.0
XMTPH = 0.0
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                                                                                                                                                                                              GØ TØ 85
                                                                                                                                                                                                                                                                  118 CONTINUE
                                                                             GØ TØ 85
                                                                                                                                                                             GØ TØ 85
                                                                                                                                                                                                         CONTINUE
                                                                                                                             TH [GH=5
                  ILOW =4
         109 LØBP= 4
                                                                                                                                                                                                                                                                                                           LL=NP+1
                                                                                                         119 LØBP=5
                                                                                                                   ILBW=5
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CALL DIF1 (XFPHL1,XFZEL1,XFPHL2,XF2EL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         CALL DIFF2 (XFPHL1,XFZEL1,XFPHL2,XFZEL2)
CONTINUE
                                                                                                         IF (M.LT.9) GØTØ 49
IF (M.EQ.9.AND.LST(1),EQ.0) GØ TØ 252
                                                                                                F (1.EQ.1.AND.NH.NE.O) GØ TØ 252
                                                                                                                                                                                                                                                           IF(LST(IR).NE.O) K=K+LST(IR)
IF (LST(IR+1).EQ.O) GBTB 44
                                                                                                                                                                                                                                                                                             XFTHLD=ST(K,LL)
IF(LST(IR+2).EQ.0) G0T0 45
                                                                                                                                                                                                                                                                                                                            xFPHLD=ST(K,LL)
45 IF(LST(IR+3).EQ.0) G0T0 46
                                                                                                                                                                                                                                                                                                                                                                      46 IF(LST(IR+4).EQ.0) GBIB 47
                                                                                                                                                                                                                                                                                                                                                                                           XMTHLD=ST(K,LL)
47 :IF(LST(IR+5).EQ.0) G0IØ 48
                                                                                                                                                                                                                                                                                                                                                                                                                                             IF (JKL.EQ.2) GØ TØ 251
                                                                                                                                                                          UB 250 JKL=1,NLCSE
                                                                                                                                                                                                                                                                                                                                                                                                                           XMPHLD=ST(K,LL)
                                                                                                                                                                                                                                                                                                                                                            XFZELD=ST(K, LL)
                                                                                                                               XNTTH = XSAVE1
                                                                                                                                           XNTPH = XSAVE2
                                                                                                                                                      XMTTH = XSAVE3
                                                                                                                                                                XMTPH = XSAVE4
                                                                            30 77 M=1, JF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    G0T0 75
8001 IERROR=8001
NERROR=11
G0T0 8888
                    XFZEL2 = 0.0
ANALYS=LINE
ANALYS=ØMTH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             1ERRØR=8002
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             1ERRØR=8007
                                                      ANALYS=NPH
                                                                  KNPHI= 0.0
                                                                                                                                                                                               XF THL D=0.0
                                                                                                                                                                                                          KFPHLD=0.0
                                                                                                                                                                                                                    x F Z E L D = 0 . 0
                                                                                                                                                                                                                              XMTHLD=0.0
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                                                                                                                                                                                                                                                   R=NL *6-5
                                                                                                                                                                                                                                                                                                                                                                                                                                       48 CONTINUE
                                                                                                                                                                                     11=NL+1
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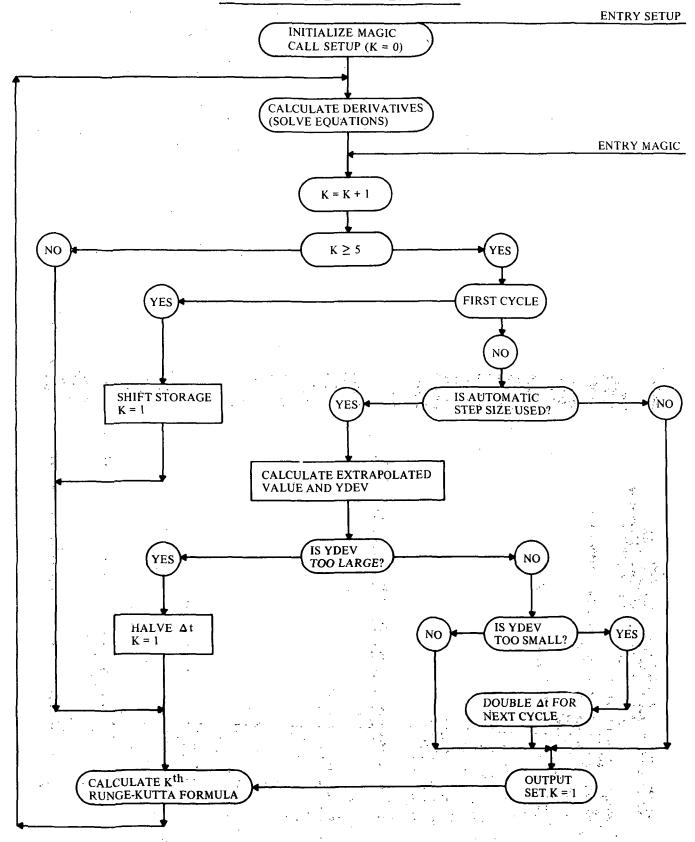
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6010 8888
8106 IERRØR = 8106
NERRØR≈22
©47© 8889
8008 LERR3R = 8008
NERR#R≈10
                                                                                                                                                                                                                                                                                               NERROR=16
GWT0 8888
8101 IERROR'= 8101
                                                                                                                                                                                                                                                                                                                                                         8102 LERROR = 8102
NERROR=18
                                                                                                                                                                                                                                                                                                                                                                                                                0018 8888
8104 IERRØR = 8104
NERRØR≈20
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8105 IERRØR ≠ 8105
NERRØR≈21
                                                                                                                                                                                                                                                                                                                                                                              CØTR: 8888
3103 1ERRØR = 8103
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               TERROR = 8107
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  BIOS IERROR = 8108
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  8109 IERRØK = 8109
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NERRØR=26
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               8787 IERRØR = 8787
                                                                                                              8086 IERROR=8086
NERROR=3
GØTØ 8888
6087 IERROR=8087
MERROR=4
                                                                                                                                                                                                                                                                           CØTØ 8888
8067 1ERKØR≈~8067
                                                                                                                                                                    COLORD BBBB.
8088 IERROR=8088.
MERROR=27
COLORD 8888.
                                CU TU 8888.
1ERROR=8031
NERROR≈ 9
                                                                GUTU 8888
IERRUR≈8036
NERRUR = 2
GUTU 8888
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NERRBR= 5
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MERRØR= 6
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                                                                                                                                                                                                                                                                                                                                  NERROR=17
                                                                                                                                                                                                                                                                                                                                               CNT0 8888
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                                                                              8036
                                                                                                                                               808†
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                                              H031
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SUBROUTINE SETUP

SETUP is a double entry subroutine called from RIEMAN. It is a mixed precision, numerical integration routine, with automatic selection of a variable integration step size, which utilizes fifth order Runge-Kutta equations to obtain the solution for first order differential equations.

SUBROUTINE MAGIC

MAGIC is an alternate entry point to subroutine SETUP.

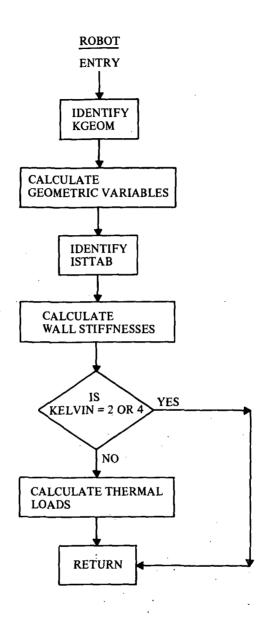


SUBKBULINE SELUP LAAGIN, EPSIL,	MAGBUT, TIC, ST DELTA, ERR, TIM	S.DTAU.	
YCBRR,Y IMPLICIT REAL+8 (A-H,0-Z Ars(x) = Dars(x)	,YDØT,YNEW,YDEV,FWDEL, -2)	TBDEL)	400030 400040 400050
ION VICS(1)	YPRED(1), YCBRR(1), YDBT(1), YNEW(1)	YNEW(1),	400060
DIMENSION C(3), D(3)			400090
COMMON /MAGIK/ KKNT Døuble precision ynem ypred	PRED		400100
•	01.500.0.00.5007		001007
AU = 110			400130
OELT			400150
11 (•		400160
10 223 IME = STEP			400180
= -		. 4	400190
YDEV(1) = 0.0 VDDED(1) = VICC(1)			400200
)			400220
) = YIC			400230
4AGBUT =-2	•		400240
~	•		400260
GIC (MAGIN	MAGBUT, TIC, STEP, NEGNS, DTAU, EPSIL	, DELT	•••
TIME, DIIM	, YICS, YPRED, YCBRR, YDB	IT, YNEW, Y DEV, FWDEL,	
CONTINUE	fr.		400280
			400290
05,			400300
417		• • •	400320
202 I = 1, NEQNS			400330
			400340
KKNT = K			400360
2 "I = I NEONS	•		400370
50 TO (9,6,7,4,11),K			400380
105			400400
TBDEL(I) = YDØT(I)			400410
			400420
I) = YNEW(I) +	C(K)*DIIME*YDØT(I)		400440
(2,2,		, n	400450
YCORR(I) = YPRED(I)			400460
+ TIME +	D(K)*DTIME		400480
0.0		. ,,	400490
- - -		***	400500
VPRED(I) = YNEW(I) + D	DTIME*(FWDEL(I) + 2.*TB	**TBDEL(I) + YDØT(I))/6.	25
), i= YCBRR(1) -			400530
18 99			400540
1 = 1		· · · · · · · · · · · · · · · · · · ·	400560
(EPSIL* ABSIYCORR(I) + ERR = ABSIYDEVII	(V(I)))14, 13, 13	400570
CONTINUE			400580

| ENGINEERING SYMBOLS (REF. 1:)

RO	r_0	
RI.	r_1	
RIDOT	r _{1,} φ	
CS CS	cos φ	
SN	sin ¢	
Α	a	
С	c	
XN	n	
F2	f ₂	
F3	f ₃	
TAN; TN	tan φ	
SEC	sec φ	
TII	T _{ii}	;
TIK	Tic	
TOK	Toc	٠
TOO	T _{OO}	
TEFREE	$\overline{\mathbb{T}}$	
HI	h	*
НО	h _o	
T	t	
TI ·	t _i	
TO	to	
SNSQ	sin ² φ	
CSSQ	cos ² φ	
CN	cos φ sin φ	,
XlCS	l/cos φ	
Xlsn	l/sin ф	
R2	r ₂	
BETA	β	

FORTRAN CODE	ENGINEERING	SYMBOLS (REF. 1)
XlROSN		$1/r_0 \sin \phi$
X1ROCS		$1/r_0 \cos \phi$
CSX1RO		cos ϕ/r_0
CSX1R1		cos ϕ/r_1
CSX1R2	. :	cos ϕ/r_2
SNX1RO		$\sin \phi/r_0$
SNX1R1		$\sin \phi/r_1$
XlRl		1/r ₁
X1R2		1/r ₂
XlRlSQ		1/r ₁ ²
X1ROSQ		1/r ₀ ²
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2500120
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.... RØUTINE ** RØBØT ** ABACUS UPDATED 07/24/72 ..... SUBRØUTINE ** RØBØT (ST,KLUE2,NRØW,NRW,LL,ER,ES,G2,G3,TIME,ITIC,JTIC, 2500010
                                             2500020
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                                                                                                                                 DØUBLE PRECISIØN SAVTIC,TIC,PHI,STØP,RESTØP,RTICK
DØUBLE PRECISIØN TEMPI,TEMP2,TEMP3,TEMP5,TEMP5,TEMPB,TEMPIO,TEMPII
DØUBLE PRECISIØN YDØT,YASAVE,YANTH,YAMPT,YAJPH,S,SN,CS,SNSQ,
CSSQ,TAN,SEC,CN,XICS,XISN,TN,XIRØ,XIRØSQ,XISNRØ,
XICSRØ,CNIRØ,SNIRØ,CSIRØ,XIRI,XIRZ,CSIRI,CSIRZ,
SNIRI,XIRZ,GR,ZSQ,RØ,BESQ,RØSQ,XNSQ,RI,RCZ,SI,
RIDØT,XNITH,XNTPH,XMTPH,XMTPH,XCII,XC22,XCIS,
XD33,XD22,XD21,XD12,XKII,XKIZ,XK21,XK22,XK33,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            COMMON /GQUAZN/ YPRED(80),YDØT(80),YASAVE(80),YANTH,YAMTH,
YAMPT,YAJPH,S,SN,CS,SNSQ,CSSQ,TAN,SEC,CN,XICS,XISN,TN,
XRRØ,XIRBSQ,XISNRØ,XICSRØ,CNIRØ,SNIRØ,CSIRB,XIRI,XIRZ,
CSIRI,CSIRZ,SNIRI,SXIRISQ,RSSQ,RØ,BESQ,RØSQ,XNSQ,BETA,RI,
RZ,SI,RIDØT,XNITH,XNIPH,XMTTH,XMTPH,XFTHLD,XFPHLD,XFZELD,
XMTHLD,XMPHLD,ETHET(2),EPHI(2),XGPT(2),ALPHTH(2),
                                                                                                                                                                                                                                                                                                                                                                                                             CØMMØN XN,TEFREE,TIC,PHI,STØP,RESTØP,RTICK,GI,XNL(2),NH
CØMMØN NST(30),NKL(30),NXMAT(20),SAVJTC(30),SAVSTP(30),JRTIC(30)
CØMMØN JRSTØP(30),NREG,NMPT,NRC,NSC,NIX,IERRØR,KGEØM,IGEØM,ISTTAB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   COMMON KELVIN, 18EGIN, NPROB, NSEG, NERROR, Q, THICK, NOJS, NLINKS, NLCAS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XC11,XC22,XC15,XD33,XD22,XD21,XD12,XX11,XX12,XX21,XX22,XX33,XD11,XNPH1,M,I,BETTA,ZETTA,SAVY(8),XC16
/SPLINS/ ANG,PSI(100),RAD(100),CUR1(100),CUR2(100),
                                                                                                                                                                                                                                                                                                                                            DØUBLE PRECISIØN YPRED,TIME
CØMMØN STØRY(16),XMAT(110,10),STD(10),SADUS(30),RADUS(30)
CØMMØN TADUS(30),UADUS(30),SAVTIC(900)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          COMMON NISKL, NZ, NBCT, LINPUT, NTRKL, NPASS, XNI, KBC, NRINGS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         GBTB (771,772,773,774,775,776,7077),KGEBM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               GEOMETRY FOR ELIPSE (G3=0FFSET DISTANCE )
                                                                                                                                                                                                                                                                                                                       XD11, XNPHI, BETA, XC16
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            DRIDP(100), ZI(14), RI(14), NRZIN
CØMMØN /ARING/ NRING(28), AMAT(30,4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ALPHPH(2), DUM, XNUTP, XNUPT;
                                                                   INTEGER SAVJTC, SAVSTP, Q, THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IF (NLCASE.EQ.1) GØ TØ 800
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IF (KBC.EQ.0) GØ TØ 500
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            SAVY(2) = ST(NRØW-L,L)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SAVY(4) = ST(NRBW-1,LL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SAVY(1) = ST(NRBW-L,L)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      = ST(NRØW,LL)
= 0.0
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                                                                                          INTEGER XN1, XN2, XN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SAVY(3) = 0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SN = DSIN(PHI)
CS = DCØS(PHI)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     BESQ=BE**2
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                                                                             // It (KGEEM.E0.1.AND.BETA.NE.1.0.AND.SN.NE.0.0)R1DØT=3.0*(R2*BETA/)
// **2*(CS/SNSU)*(R1*SN-RØ)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    RIDGT = -XN3*A#{SN**XNEXP#CS/4.0)*(2.0/(1.0+SN**XNI))**XN5
  CSSQ, = CS*#2
R2 = A*DSQRT(1.0/(SNSQ+BESQ*CSSQ))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      = A*(2.0/(1.0+SN**XN1))**XN2
                                                                                                                                                         1F(G3 .EC. 0.0)GB TB 7775
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 = (A/2.0)*(R2/A)**XN3
                                                                                                    IF(SN_EQ. 0.0)GØ TØ 779
R2 = R2-G3/SN
                                                                                                                                                                                                                                                             IF (SN.EQ.0.0) GBTB 777
                                                                                                                                                                                                                                                                                                                                                                                                                                         GEBMETRY FOR CYLINDER
                                             R1=R2*R2SQ*BESQ/ASQ
                                                                                                                                                                                                        GERMETRY FOR BGIVE
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          GENERAL GEOMETRY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           MODIFIED ELLIPSE
                       R250 = R2##2
                                                                                                                                                                     K100T = 3.0*63
                                                                                                                                                                                                                                       (IHd)NISO = NS
                                                                                                                                                                                                                                                 = DC@S(PH1)
                                                                                                                                                                                                                                                                                                                                                   CS = C0S(61)
                                                                                                                          R2-50 = R2##2
                                                                                                                                                                                                                                                                                                         R0 = R1 + SN-C
                                                                                                                                                                                                                                                                                                                                                                                              R2=CS+SN*PHI
                                                         0ES0=8E**2
                                                                                                                                                CB TB 7775
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                                                                                                                                                                                                                                                                      R2=R1-C/SN
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GØTØ 7775
                                                                                                                                     RB = RB-G3
                                                                                                                                                                                  RB = -63 .
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                810øT=0.0
                                                                     RIDOT=C.0
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             RØ=R2#SN
                                    KØ=R2#SN
                                                                                                                                                                                                                                                                                   GØTØ 778
                                                                                                                                                                                                                                                                                             R2 = 1.0
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                                                                                                                                                                                                                                                                                                              RI = CURI(J-1)+(CURI(J)-CURI(J-1))*SUB1/SUB2

R2 = CUR2(J-1)+(CUR2(J)-CUR2(J-1))*SUB1/SUB2

R1DGT = DR1DP(J-1)+(DR1DP(J)-DR1DP(J-1))*SUB1/SUB2
                                                                                                                                                                                                                                                                            SUB1 = ARG-PSI(J-1)
SUB2 = PSI(J)-PSI(J-1)
RØ = RAD(J-1)+(RAD(J)-RAD(J-1))*SUB1/SUB2
                                                                               PHC = PSI(J)
IF (ANG.EQ.A) IF (ARG-PH0) 221,223,204
IF (PH0-ARG) 221,223,204
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                       R2 = A/DSGRT(SN)
R1 = 0.5 * R2
R2 * SN
R1 = 0.5 * L2
R1 = - ((A**2)*0.5)*(R1*CS)/R0**2
IAN=SN/CS.
                             SEC= 1.0/CS
IF (TIME.EQ.TIC) CALL GEOMET
ARG = PHI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   IF(TIME.EQ.TIC) RTICK=RU
IF (NCYC.GT.1) GB TB 491
IF (TIME.NE.TIC) GB TB 491
RADUS(ITIC) = RB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               AMAT(ITIC,1) = SAVY(7)
AMAT(ITIC,2) = SAVY(8)
IF (NSC.NE.1) G0 T0 491
SADUS(JTIC) = R0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  AMAT(JTIC,3) = SAVY(7)
AMAT(JTIC,4) = SAVY(8)
                                                                                                                                                                                                                                                                                                                                                              ISATENSAID GEAMETRY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       X1CSRØ=1.0/(CS*RØ)
                                                                                                                                                                                          RIDØT = ORIOP(J)
GØ TØ 7775
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             X1RØSQ=1.0/RØ*#2
                                                                      UB 204 J=1,100
                                                                                                                                                                                                                                                                                                                                                                                     SN = DSIN(PHI)
CS = DC@S(PHI)
SN = DSIN(PHI)

CS = DCBS(PHI)
                                                                                                                                                       RB = RAD(J)
RI = CURI(J)
R2 = CUR2(J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     RØSQ = RØ##2
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                                                                                                                                                                                                                  NERROR = 41
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 CN1RØ=CN/RØ
SN1RØ=SN/RØ
                                                                                                                                                                                                                                          NERROR = 42
                                                                                                                                            60 12 8503
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                       TAN= SN/CS
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                                                                                                                                                                                                                                        COMPUTATION OF K AND D FOR MATERIAL PROPETY INPUT
                        CSSQ=CS**2
IF(KGEBM.EQ.4.8R.KGEBM.EQ.3) GBTB 79
RISQ = R1**2
R2SQ = R2**2
                                                                                                                                                                                                                                                                                         GØ TØ .(703,702,701,701), THICK
                                                                                      XI SNRB=1.0/( SN*RB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ZETTA = ST(7,LL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              HETTA=ST (6,L
                                                                                                                                                                 X1R1SQ=1.0/R
                                                                                                                           CSIRI=CS/RI
CSIRZ=CS/RZ
SNIRI=SN/RI
                                                                                                                                                                                                                                                                                                                    T = ST(3, LL)
HI= ST(2, LL)
                                                                            X1SN=1.0/SN
                                                                                                                                                                                                                                                                                                        HB= ST(4,LL
                                                                                                                X1R2=1.0/R2
                                                                                                    X1R1=1.0/R
                                                                                                                                                                             XNTTH=0.0
                                                                                                                                                                                           XNTPH=0.0
                                                                                                                                                                                                       XMTTH=0.0
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                                                                                                                                                                          RANKIN=THSTND MEANS INTERPOLATE, COMPUTE NTEMP, MTEMP
RANKIN=NOTHRM MEANS DO NOT INTERPOLATE, DO NOT COMPUTE NTEMP, NTEMP
RANKIN=THCNST MEANS DO NOT AVERAGE, BUT INTERPOLATE, COMPUTE
NTEMP
RANKIN=THINHO MEANS INTERPOLATE, BUT DO NOT COMPUTE NTEMP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         GØ TØ (103,42,103,42,47,49,42,47,49,42,47,49),ISTTAB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     CØNTINUE
TEMP3= (1.0-XNUPT * XNUTP)
PERM= TEMP3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                E1= (ETHET(1)+ EPHI(1))/2.
E2= (ETHET(2)+ EPHI(2))/2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             GØ TØ (42,47,49,41),THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (D11= TEMP2/(12.0* TEMP3)
TEMP1= EPHI(1)* HI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        TEMP2/(12.0* TEMP3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              4.7 EPSUM= FPHI(1)+ EPHI(2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       (D33= XK33*HI**2/12.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     fEMP1= ETHET(1,) * HI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   TEMP2= TEMP1 # HI##2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           EMP2= TEMPI*HI**2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XK22= TEMP1/TEMP3
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                                                                        BETTA = ST(6,LL
                                                                                                                                                                                                                                                                                                                                                                                                    ST(10, LL
                                           XIPH = ST(4, LL
                                                          SPH = ST(5,LL
                                                                                                                                                                                                                                                                                 XK11=ST(2,LL)
XK12=ST(3,LL)
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35 HI = ST(7, LL
                                                                                                                   XITH = XIPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               ES1= E1+E2
                                                                                                     CTH = CPH
                                                                                                                                  STH = SPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                            XK21 = XK1
XD21' = XD1
GØ TØ 103
                                                                                       ATH = APH
                                                                                                                                                              ST10, RWAF
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                                                                                                                                                                          XDII=(XKII* HI**2)/12.+ HI*( ETHET(I) * ZBHIN + ETHET(2)*ZBHBUT)
                                                                                                                                                                                                                                                                                                                                                  ZBRIN = ((E1+HI*+2)+(E2*H0*+2) +(2.0*E2*H0*HI) +(2.0*E2*H0*T)) /
                                                                                                                                                                                                                                                                                                                                                                                           ZBRKUT=((E1*H[**2)+(E2*H0**2) +(2.0*E1*H0*H]) +(2.0*E1*H[*T]) /
                                                                                                                                                                                                                xU22=(XK22* HI**2)/12.+ HI*( EPHI(1) * ZBHIN + EPHI(2)* ZBHBUT)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XU22= ( U22 +(HI*EPHI(I)*ZBHIN) + (HØ*EPHI(2)* ZBHØUT)) /PERM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         + (HØ*ETHET(2)*ZBHØUT))/PERM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             DETERMINE COMPLETE CONSTÂNTS DEPENDENT ON REINFORCEMENT CLUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             (033 = (XGPT(1)*HI**3+XGPT(2)*H0**3)/12.+HI*(XGPT(1)*ZBHIN)+
                                                                                                                                   XU33= (HI**3*(XCPT(1).+XGPT(2)))/12.0+ HI*(XCPT(1)* 28HIN
                                                                            ZBRBUT = (HI*(E2+3.0*E1)+2.0*E1*T)/(2.0*ES1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       011 = (ETHET(1)*HI**3 + ETHET(2)*H0**3)/12.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XÜII=(DI1+ (HI*ETHET(I)*ZBHIN) + (HØ*ETHE
D22 = (EPHI(I)* HI**3 + EPHI(2)*HØ**3)/I2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    r033= x033 + GJPH/(4.0*SPH)+ GJTH/(4.0*STH)
                                                          ZBRIN = (HI*(E1+3.0*E2)+2.0*E2*T)/(2.0*ES1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      XK11= (ETHET(1)* HI + ETHET(2)* HØ)/PERM
XK22= (EPHI(1) * HI + EPHI(2) * HØ)/PERM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (K33= XGPT(1)*HI + XGPT(2) * HØ
                                      XK33= HI*(XGPT(1)+ XGPT(2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                     BHBUT = (ZBRBUT-HB/2.0)**2
                                                                                                                   ZBHBUT=(ZBRBUT-H[/2.0)**2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               IF(ISTIAB .EQ.2)GB TB 103
                                                                                                                                                         XGPT(2) * ZBHØUT)
                                                                                                 28HIN= (28RIN-HI/2.0) **2
                                                                                                                                                                                                                                                                                                                                                                                                                                   (BHIN = (ZBRIN-HI/2.0)**2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              38 18 (58,60,100),KLUE2
XK11= ETSUM * HI/PERM
XK22= EPSUM * HI/PERM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         (022= - X022 - EISPH
                                                                                                                                                                                                                                                                                                                                                                        1 (2.0*(E1*HI+E2*HØ))
                                                                                                                                                                                                                                                                                                                                                                                                                 (2.0*(E1*HI+E2*HØ))
                                                                                                                                                                                                                                                                                             UNEQUAL FACE SHEETS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      EISPH= ES* XIPH/SPH
EISTH= EB* XITH/STH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XGPT(2)*ZBHØUT*HØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              XK11= XK11+ EASTH
XK22= XK22+ .6ASPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 ST CLUE(10,11,12)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   TASTH=ER*ATH/STH
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            KIZ= XKII*XNUIP
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                                                                                                                                                                                                                                                                                 SN4T02 = 4.*SINB2
XD22 = -XD22-2.0*C0SB**3*EDI-SN4T02*C0SB*GRI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XK12=XK11*XNUTP + (EASTH*SNB#ØNEC2B/CSB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        KC22= EASTH*CTH* (CSB/SNB * DNEC2B)
KD12=-XD11*XNUTP- EISTH*(SNB*DNEC2B/CSB)
                                                                                                                                                                                                                                                                                                                                                                                                         XK12= XK11*XNUTP + (2.0*CØSB*SINB2*ED)
                                                                                                                                                                                                                                                                                                                                                    *2*GRI)/ CØSB) + (2.0*CØSB*SINB2*EDI)
XDI2 = -XDI1*XNUIP-(2.0*CØSB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               SCB2 = (SNB-CS2B*SNB + 2.)/(2.0*CSB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     KC11= (EASTH*CTH* SCB2 )
KC15=EASTH*CTH*( SNB* ØNEC2B/CSB )
                                                                                                                                                                                                                            GRI= ER* 12/(2.0*(1.0 + XNUTP)*D)
XC11 = C.IH*SN2T@4/CØSB*ED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (D22 = -XD22-EISTH*(CSB/SNB*@NEC2B
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XK22=XK22+ EASTH*(CSB/SNB*ØNEC2B)
XK33=XK33+ EASTH* SN2B
                                                                                                                                                                                                                                                                                                                                                                                        *SINB2*ED1)-(SN4TØ2*CØSB*GRI)
                                                                                                                    SINB2= SINB**2.
HL = 2.0*(ABS(ZETTA)-ABS(CTH))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (D11 = -XD11-SN2TØ4*EDI/CØSB-(
                                                                                                                                                                                         2.0*CTH*CØSB*SINB2*ED
                                                                                                                                                                                                                                                                                                                                                                                                                                            XK33=XK33+(2*CØSB*SINB2*ED)
                                                                                                                                                                                                                                                                                                                 TB= 2.0* BETTA
XD33 = XD33+((4.0*C0S(TB)*
                                                                                                                                                                        XC22 = 2.0*CTH*CØ58**3*ED
                                                                                                                                                                                                                                                                                                                                                                                                                                                              XK11=XK11+(SN2TØ4*ED/CØSB)
                                                                                                                                                                                                                                                                                                                                                                                                                          XK22=XK22+(2*CØSB**3*ED)
                                                                                                                                                         2=(ATH*#3.)/(3# HL##2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                =SIN(TBETTA) /2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           I- EISTH*SCB2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              (D33= XD33+ EISTH*SN2E
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XK11=XK11+ EASTH#SCB2
                                                                    SN2104 = 2#(.SINB*#4.)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             NEC28=(1.0+ CS28)/2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         (C16=EASTH*CTH*SN2B
                                                                                     D= STH*(CØSB+SINB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           BETIA= 2.0*BETIA,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                SN4TØ2 CØSB * GRI)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            CS28= CØS(TBETTA)
                                 SINB =SIN(BETTA)
                                                  COSB =COS(BETTA
                                                                                                                                                                                                                                                                EDI = ER*XITH/D
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SNB =SIN(BETTA)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     I SG CLUE (7,8,9)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           CSB =CBS(BETTA
                                                                                                     ED = ER*ATH/D
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 xD21 = xD12
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               60 CONTINUE
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1Ø = (E1*HI**2-E2*HØ**2+2.0*E1*HI*T)/(2.0*(E1*HI+E2*HØ))

XNTH = ETHKI*0.5*(HI*TEMP61)+ETHK2*0.5*(HØ*TEMP62)

XNTPH= EPHKI*0.5*(HI*TEMP61)+EPHK2*0.5*(HØ*TEMP62)

XMTH = ETHKI*0.5*(HI**2*TEMP71/3.0+TI*HI*TEMP61)-ETHK2*0.5*(HØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   XMTPH = EPHK1*0.5*(HI**2*TEMP71/3.0*TI*HI*TEMP61)~EPHK2*0.5*(H0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         TEM11 = ((-XK22*XD22)**.5)/(48.0**.5)

XNITH =(XK11/4.0 *TEMP11)* TEMP61 + (XK11/4.0*TEMP12) * TEMP62

XNITH =(XK22/4.0 *TEMP21)* TEMP61 + (XK22/4.0*TEMP22) * TEMP62

XMTTH = TEMP10*(TEMP11*TEMP71 - TEMP12* TEMP72)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TEMP8#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | XMTTH = (ETHK1 * TEMP8 * (HI*TEMP?1/3.0+ TI*TEMP61)) - (ETHK2 | TEMP8*(HI*TEMP62)) - (ETHK2 | XMTPH = (EPHK1 * TEMP8 * (HI*TEMP71/3.0+ TI*TEMP61)) - (EPHK2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       TEMP4 * (TEMP61 + TEMP62)
TEMP5 * (TEMP71- TEMP72)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           - TEMP72
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TEMP8*FEMP61 + EPHK2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TEMPS # (TEMP71
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               TI = (HI*(E2-E1)+2.0*E2*T)/(2.0*(E1+E2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                IB = \{HI*\{EI-E2\}+2.0*EI*T\}/\{2.0*\{EI+E2\}\}
                                                                                                                                                                                                                                                           TEMP21= ALPHPH(1)+ XNUPT * ALPHTH(1)
TEMP22= ALPHPH(2)+ XNUPT * ALPHTH(2)
TEMP3 = 1-XNUPT*XNUTP
                                                                                                                                                                                                                             717 TEMP11= ALPHTH(1)+ XNUTP * ALPHPH(1)
                                                                                                                                                                                                                                               fempl2= alphTH(2)+ xnuTp * alphPH(2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             814 TEMP10=((-XK11*XD11)**.5)/(48.0**.5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  1 TEMP8+(HI*TEMP72/3.0+TØ*TEMP62))
                 GØ TØ (716,714,715,714),KELVIN
TII = ST(NRW+1,LL)
TIK = ST(NRW+2,LL)
                                                                                                                                                                                                                                                                                                                                                                                                                                    | IEMP71= 2.0* TII +TIK-3*TEFREE | IEMP72= 2.0* T00 +T0K-3*TEFREE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                GD TØ (811,812,813,814), THICK
                                                                                                                                                                                                                                                                                                                                            ETHET(1) *TEMP11/TEMP3
                                                                                                                                                                                                                                                                                                                                                                                ETHK2 = ETHET(2)*TEMP12/TEMP3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           EPHK1 = EPHI(1) *TEMP21/TEMP3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             EPHK2 = EPHI(2)*IEMP22/TEMP3
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                                                                                                                                                                                                                                                                                                                                                                                                 TEMP61= TII+ TIK-2* TEFREE TEMP62= T00+ T0K-2* TEFREE
                                                                                                                                                                                                                                                                                                                                                              FEMP5 = HI**2/24.0
                                                                         10K = STINRM+3,LL)
                                                                                           FOR = ST(NRW+4,LL)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         USE SPLICØ TØ REPRESENT RI(I) AS A FUNCTION OF SØUT(I). THEN USE SPLINE TØ INTERPOLATE RADO AND CORRESPONDING DERIVATIVES. FROM THESE, COMPUTE THE THO PRINCIPAL RADII OF CURVATURE,
                                                                                                                       INTERSECTION OF THE CORRESPONDING RILL). AND
                                                                                                                                                                                                                                                                                                                                                                                       PASS SPLINE CURVE THRBUGH INPUT PBINTS BN SHELL MERIDIAN, AND
                                THIS SUBROUTINE CALCULATES THE GEOMETRY FOR A SHELL SEGMENT.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                COMPUTE MERIDIONAL ARC LENGTH TO INTERPOLATED POINTS BY NUMERICAL INTEGRATION (SIMPSONS RULE). SINCE SIMPSONS RULE REQUIRES AN EVEN NUMBER OF PARTITIONS, INTERPOLATE A POINT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 MIDWAY BETWEEN EACH PAIR OF POINTS USING SUBROUTINE SPLINE.
                                                                                                                                                                                              /SPLINS/ ANG. PSI(100), RAD(100), CURI(100), CUR2(100),
                                                                                                                                                           NUMBER OF (RI,ZI) PAIRS READ AS INPUT.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CALL PLINE (ZI,RI,NRZIN,CI,ZI(I)+DZ2,FAKEI,DRDZM,FAKE2)
SØUT((+1) = SØUT(I) + DZ6*(FUN(DRDZ(I)) + 4.0*FUN(DRDZM)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   CALL PLINE (SØUT, RI, NRŽIN, CI, S(!), RAD(!), RADD(!), RADD2):
IF (ABS(RADD(!)), GT.1.0) RADD(!)=1.0
FACTUR =: SQR(!1.0-RADU(!)**2)
CURI(!) = -RADD(FACTUR
CURZ(!) = FACTUR/RAD(!)
                                                    THE INPUT VARIABLES ARE . . . RATIS OF REV. TO POINTS
                                                                                                         ZI(I) - - DISTANCE ALONG AXIS OF REV. TO THE
                                                                                                                                                                                                             DRIDP(100), ZI(14), RI(14), NRZIN
DIMENSION CI(4,13), DRDZ(14), SOUI(14), S(101), RADD(100)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                CALL PLINE (ZI,RI,NRZIN,CI,ZI(I),FAKEI,DRDZ(I),FAKE2)
 RBUTINE ** GEBMET ** ABACUS UPDATED 07/24/72 ....
                                                                                        ON SHELL MERIDIAN.
                                                                                                                                           THE AXIS OF REV.
                                                                                                                                                                                                                                                                                                                                                                                                             COMPUTE DR/DZ AT THESE POINTS.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    CALL PLICE (SBUT;RI;NRZIN,CI)
                                                                                                                                                                                                                                                                    FUNIARG) = SORT(1.0 + ARG**2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             FUN (DRDZ (1+1)))
                                                                                                                                                                                                                                                                                                                                                                                                                                             CALL PLICE (ZI,RI,NRZIN,CI)
                                                                                                                                                                                                                                                                                                                                                        IF (ANG.EQ.B) AMULT = -1.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   &LDH1 = SØUT(NRZIN) /99.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SBUT(1) = 0.

DB 70 I=1,NDELZ

DZ2=(ZI(I+1)-ZI(I))/2.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   S(1) = FLØAT(1-1)*0LDH1
                                                                                                                                                                                                                                                                                                       RADS = 3.1415926/180.0
                   SUBROUTINE GEBMET
                                                                                                                                                                                                                                                                                                                                                                                                                                                              NDELZ = NRZIN - 1
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                                                                                                                                                             NR 2 IN
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    CUR2 = 1/R2
                                                                                                                                                                                                                                                                                                                                        AMULT = 1.0
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                                                                                                                                                                                                                                                                                                                       DATA B/-B
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  CONTINUE
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                                                                                                                                                                              IF (ANC.FQ.B) G8 T3 190
BRIDP(J-1) = (CURI(J)-CURI(J-I))/(PSI(J)-PSI(J-I))
                                                                                                                                                                                                       G0 TW 180
URIDP(J-1) = (CURI(J-1)-CURI(J))/(PSI(J-1)-PSI(J))
                                                SINPSI -= -AMULT*RAD(J) +CUR2(J)
                                                                PSI(J) = 2.0*3.1415926-PSI(J) CENTINUE
                                                                                                CURI(J) = -AMULT/CURI(J)
CURZ(J) = -AMULT/CURZ(J)
IF (J.EG.1) GØ TØ 180
                                                            IF (ANG.EQ.B) GB TB 179
                                                                                                                                                                                                                                                                      ORIUP(J) = URIDP(J) #0.1
                                                                                                                                                                                                                                            ORIDP(100) = DRIDP(99)
                         COSPSI = AMULT*RADD(J)
                                      PSI(1) = ARCBS(CBSPSI)
                                                                                                                                                    IF (J.EQ.2) GØ TØ 181
                                                                                                                                                                                                                                                         00 45 J=1,100
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              SUBRÖUTINE PLICG (X,Y,M,C)
SUBRBUTINE TO DETERMINE C(1,K),C(2,K),C(3,K) AND C(4,K).
DIMENSION X(14),Y(14),A(14,3),B(14),Z(14)
DIMENSION D(13),P(13),E(13),C(4,13)
MM = M-1
DE 10 K=1,MM
 ** ABACUS UPDATED 05/20/72 ....
                                                                                                                                                                                                                                                              A(K,2) = 2.0*(P(K-1)+P(K))-P(K-1)*A(K-1,3)

B(K) = B(K)-P(K-1)*B(K-1)
                                                                                                                                                                                                             - P(1) # A(1,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        C(3,K) = Y(K)/D(K)-Z(K)*P(K)
C(4,K) = Y(K+1)/D(K)-Z(K+1)*P(K)
RETURN
END
                                                                                                                                                                                                                                                                                                                                                                                                                               Z(K) = B(K)-A(K,3)*Z(K+1)

Z(1) = -A(1,2)*Z(2)-A(1,3)*Z(3)
                                                                                                                                                                                                                                                                                                                                   A(M_1) = 1.040+A(M-2,3)

A(M_2) = -Q-A(M_1)*A(M-1,3)

B(M) = B(M-2)-A(M_1)*B(M-1)
                                                                                              D(K) = X(K+1) - X(K)
P(K) = D(K)/6.0
E(K) = (Y(K+1)-Y(K))/D(K)
U@ 20 K=2,MM
                                                                                                                                                    U(K) = E(K) - E(K-1)
A(1,2) = -1.0-D(1)/D(2)
A(1,3) = D(1)/D(2)
A(2,3) = P(2)-P(1)*A(1,3)
                                                                                                                                                                                                          A(2,2) = 2.0*(P(1)+P(2))
A(2,3) = A(2,3)/A(2,2)
B(2) = B(2)/A(2,2)
                                                                                                                                                                                                                                                                                          A(K,3) = P(K)/A(K,2)

B(K) = B(K)/A(K,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         0 = 1.0/(6.0*D(K))
                                                                                                                                                                                                                                                                                                                                                                             ((M) = B(M)/A(M,2)
                                                                                                                                                                                                                                                                                                                      = D(M-2)/D(M-1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      C(1)(K) = 2(K) * 0
                                                                                                                                                                                                                                                                                                                                                                                                      UB 40 I=1,MN
                                                                                                                                                                                                                                                                                                                                                                                                                                                             GB 50 K=1, MM
                                                                                                                                                                                                                                                   118 30 K=3,MM
                                                                                                                                                                                                                                                                                                                                                                                         M-2 M-2
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               SUBRBUTINE PLINE (X,Y,M,C,XINT,YINT,DYDX,DZYDX2)
SUBRBUTINE FOR SPLINE FIT INTERPOLATION IN THE TABLE OF VALUES
(X1,Y1) IO (XM,YM), WHERE M MAY BE AS LARGE AS 100, WHERE THE
CONSTANTS C(1,K),C(2,K),C(3,K) AND C(4,K) ARE ALREADY COMPUTED
                                                                                                                                                                                                                                                                                                                        60 YINT = (X(K+1) - XINT)*(C(1,K)*(X(K+1)-XINT)**2+C(3,K))
YINT = YINT + (XINT-X(K))*(C(2,K)*(XINT-X(K))**2+C(4,K))
70 DYDX=-3.0*(C(1,K)*(X(K+1)-XINT)**2-C(2,K)*(XINT-X(K))**2)
                                                                                                                                                                                                                                                                                                                                                                                               D2YDX2=6.0*(C(1,K)*(X(K+1)-XINT)+C(2,K)*(XINT-X(K)))
                                                                                                        SUBRBUTINE ALSØ CØMPUTES DY/DX AND D2Y/DX2 AT XINT. DIMENSIØN X(14),Y(14),C(4,13)
IF (XINT-X(1)) 80,10,20
** ABACUS UPDATED 05/20/72
                                                                                                                                                                                                                                                                                                                                                                                                                                                   FORMAT (31H BUT OF RANGE FOR INTERPOLATION)
                                                                                                                                                                                                                   20 K = 1
30 IF (XINT-X(K+1)) 60,40,50
40 YINT = Y(K+1)
                                                                                                                                                                                                                                                                                                                                                                                  -C(3,K)+C(4,K)
 ROUTINE ** PLINE
                                                                                                                                                                                                                                                                                                         IF (M-K) 80,80,30
                                                                                                                                                                                                                                                                                                                                                                                                                                    WRITE (6,90)
                                                                                         AND STØRED.
                                                                                                                                                              10 YINT = Y(1)
                                                                                                                                                                                                  GB TB 70
                                                                                                                                                                                                                                                                                                                                                                                                                   RETURN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         RETURN
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SUBROUTINES DIF1 AND DIFF2

These subroutines are called in RIEMAN as necessary. DIF1 contains the differential equations for the THIC and ST clues, while DIFF2 contains the differential equations for the RWA and ISG clues. Geometry clues, trigonometric values, and predicted values of the differential equation variables are passed via label common area, EQUAZN, to subroutines DIF1 or DIFF2. The coefficients for nonlinear and load terms, X1, X2 and K, are identified depending upon the pass number and convergence criterion.

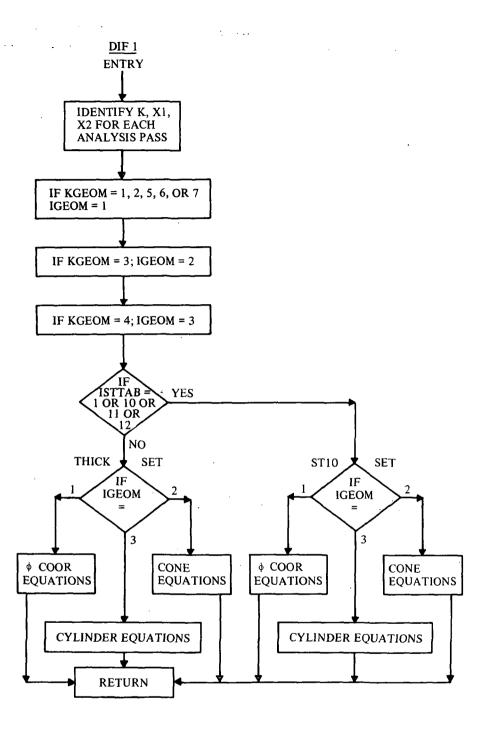
The specific derivative equations and auxiliary equations are contained in these subroutines. The values of each derivative equation, YDOT, and each auxiliary equation, YA ---, are returned to RIEMAN via label common EQUAZN.

A special equation counter, I, is used in these subroutines, which counts in increments of eight. The first eight values of I, 1 through 57 (in increments of eight), correspond to the eight sets of initial conditions required to compute the segment stiffness matrices in subroutine SEGMAT. The subsequent values of I, 65 and 73 maximum (again in increments of eight) correspond to the computation of each set of eight equations for each loading condition (two conditions corresponding to dead and live loads respectively).

	FORTRAN CODE	ENGINEERING SYMBOLS (REF. 1)			
	XN	-	n		
a i	YDOT (I)		$^{\mathrm{T}}$ $_{\phi}$ $_{\theta}$ $_{\phi}$	dT ds	<u>θ</u>
55. - 3	YDOT (I + 1)		Ν _{φ,φ}	dN ds	
	YDOT (I + 2)		J_{ϕ} , ϕ	dJ ds	
and Section 1995. The section of the section 1995 and the section 1995 a	YDOT (I + 3)		М ф,ф	$\frac{dM}{ds}$) •
Justinia Wit	YDOT (I + 4)	ar e e	U, _φ	$\frac{dU}{ds}$	
in the second	YDOT (I + 5)		V, , ,	$\frac{dV}{ds}$	
	YDOT (I + 6)		W, φ	$\frac{dW}{ds}$	
	YDOT (I + 7)		ϕ , θ	$\frac{\mathrm{d}\Omega_{\boldsymbol{\theta}}}{\mathrm{d}\mathbf{s}}$	
	YPRED (I)		$^{\mathrm{T}}{}_{\varphi\theta}$		
•	YPRED (I + 1)		Иф		
	YPRED (I + 2)		J_{ϕ}		
	YPRED (I + 3)		$^{\mathrm{M}}_{\phi}$		
	YPRED (I + 4)		Ŭ		
	YPRED (I + 5)		V		
	YPRED (I + 6)		W		
	YPRED (I + 7)		$\Omega_{oldsymbol{ heta}}$		
	YAMPT		$^{\mathrm{M}}_{\mathrm{\varphi}\theta}$		
	YANTH		N _e		

YAMTH

FORTRAN CODE	ENGINEERING SYMBOLS (REF. 1)
R2SQ	r ₂ .
ROSQ	r_0^2
X1RO	1/r ₀
S	s
XK12	K ₁₂
XK21	K ₂₁
XD12	D ₁₂
XD21	D ₂₁
XCli	C _{ll}
XC22	C ₂₂
XNSQ	n ²
Non-Linear Rede	finitions (Ref. 1)
YDOT (I+2)	*J • • • • • • • • • • • • • • • • • • •
YPRED (I+2)	*J •
YAJPH	$^{\mathrm{J}}{}_{\phi}$
XNL	a ·
XNPHI	$\frac{\omega}{N}_{\Phi}$
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                                                                                       DØUBLE PRECISIØN SAVTIC,TIC,PHI,STØP,RESTØP,RTICK
DØUBLE PRECISIØN YPRED
DØUBLE PRECISIØN YDØT,YASAVE,YANTH,YAMTH,YAMPT,YAJPH,Š,SN,CS,SNSQ,
                                                                                                                                                                                                                                                                                                                                             COMMON XN,TEFREE,TIC,PHI,STØP,RESTØP,RTICK,GI,XNL(2),NH
COMMON NST(30),NKL(30),NXMAT(20),SAVJTC(30),SAVSTP(30),JRTIC(30)
COMMON JRSTØP(30),NREG,NMPT,NRC,NSC,NIX,IERRØR,KGEØM,IGEØM,ISTTAB
COMMON KELVIN,IBEGIN,NPRØB,NSEG,NERRØR,Q,THICK,NØJS,NLINKS,NLCASE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        XNTTH,XNTPH,XMTTH,XMTPH,XFTHLD,XFPHLD,XFZELD,XMTHLD,XMPHLD,ETHET(2),EPHI(2),XGPT(2),ALPHTH(2),ALPHPH(2),DUM,XNUTP,XC11,XC22,XC15,XO33,XD22,XD21,XD12,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XNUPT#YPRED(I+1)+(XK11-XNUPT##2#XK22)#(XN#YPRED(I+4)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               CSSQ, TAN, SEC, CN, X1CS, X1SN, TN, X1R0, X1R0SQ, X1SNR0,
                                                                                                                                                                                     XICSRØ, CNIRØ, SNIRØ, CSIRØ, XIRI, XIRZ, CSIRI, CSIR2,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             XIR1, XIR2, CSIR1, CSIR2, SNIR1, XIR1SQ, R2SQ, R0, BESQ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   F (KGEBM.EQ.1.BR.KGEBM.EQ.2.BR.KGEBM.EQ.5.BR.KGEBM.EQ.6) IGEBM
                                                                                                                                                                                                          SNIR1, XIR1SQ,R2SQ,R0,BESQ,R0SQ,XNSQ,R1,R2,S1,
R1D0T, XNITH,XNTPH,XMTTH,XMTPH,XC11,XC22,XC15,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               /PRED(I+7)+YPRED(I+4)*(CS1R1-CN1R0)+XN*YPRED(I+5)*
                                                                                                                                                                                                                                                    XD33, XD22, XD21, XD12, XK11, XK12, XK21, XK22, XK33,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    YPRED(I+5)*CS-YPRED(I+6)*SN)*X1RØ+K*(XNUPT*XNTPH-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    (SNIRB+X1R1)+2.0*XN*YPRED(I+6)+CS1RB+YPRED(I)*SN/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XIRB, XIRBSQ, XISNRB, XICSRB, CNIRB, SNIRB, CSIRB,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PRED(I+4)*SN-XNSQ*YPRED(I+6))+YPRED(I+7)*CS)+K*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 S, SN, CS, SNSQ, CSSQ, TAN, SEC, CN, X1CS, X1SN, TN,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         [-1.0/((RB/XD33)+(SNSQ*XIRB/XK33))) + (-2.0*XN*
                                                                                                                                                                                                                                                                                                  STØRY(16), XMAT(110,10), STD(10), SADUS(30), RADUS(30)
TADUS(30), UADUS(30), SAVTIC(900)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YPRED(I+2)-YPRED(I+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                             NISKL, NZ, NBCT, LI NPUT, NTRKL, NPASS, XN1, KBC, NRINGS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      COORDINATE )
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XK33+SN*YABPH*(X1*SAVY(3)+X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   XN*YPRED(1+6)*X1R8-YPRED(1+4)*SN1R8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -YPRED(1+7)*(X1*SAVY(2)+X2*SAVY(5))
UPDATED 07/07/72
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   COMMON /EQUAZN/ YPRED(80), YDØT(80), YASAVE(80),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              XK11,XK12,XK21,XK22,XK33,XD11,
                   SUBRBUTINE DIF: (XFPHL), XFZEL1, XFPHL2, XFZEL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        THE FOLLOWING EQUATIONS ARE THE -THICK- SET
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YANTH, YAMTH, YAMPT, YAJPH,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        · PHI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  A XNPHI,M, I, BETTA, ZETTA, SAVY(8), XC16
LQUIVALENCE (XNL(1),XI), (XNL(2),X2)
IF (NH.NE.O), WRITE(6,1333) PHI,SAVY
FORMAT(1X, IPIE16.7,5X,1P6E16.7)
                                                                                                                                                                                                                                                                              XD11, XNPHI, BETA, XC16
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       RØSO, XNSO, BETA, RI, RZ, SI, RIDØT,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    EQUATIONS FOR SHELLS OF REVOLUTION
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YPRED(I)+YAMPT*SNIRØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             XNUPT * XMTPH-XMTTH)
                                             INTEGER SAVJTC, SAVSTP, Q, THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  F (KBC.EQ.O.AND.NH.EQ.O) K
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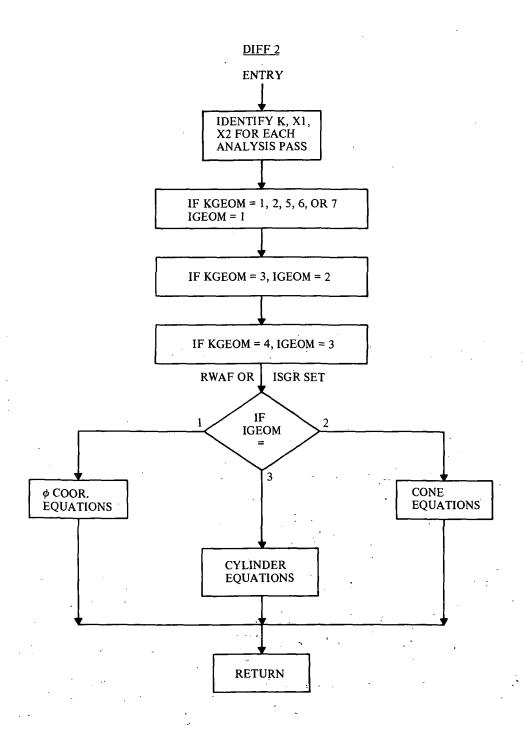
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YPRED(1+4)*SN/S+XN*YPRED(1+5)*TN/S+2.0*XN*YPRED(1+6)/S+YPRED
[1]*SN/XK33+SN*YAØPH*(X1*SAVY(3)+X2*SAVY(6)))
YAJPH = YPRED(1+2)-YPRED(1+1)*(X1*SAVY(3)+X2*SAVY(6))
R1*(YPRED(I+4)*CS1R@+XN*YPRED(I+5)*X1R0+YPRED(I)/XK33+
                                                                                                                                                                                                                                                                                                                                                                             -RI*((EPSITH+EPSIPH)*(X1*XFPHL1+X2*XFPHL2)-YPRED([+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       YANTH=XiUPT*YPRED(I+1)+(XK11-XNUPT**2*XK22)*(X1CS/S)*(XN*YPRED(I+4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         YAMTH=XNUPT*YPRED(1+3)-(1.0/S)*X1CS*(XD11-XNUPT*#2*XD22)*((1.0/S)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           =-2.0*YPKEU(I)/S+XN*YANTH*X1CS/S-XN*YAMTH*SN*X1CS**2/S**2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      TAN/S*(YABPH*(X1*SAVY(1)+X2*SAVY(4))-YANPT*(X1*SAVY(3)
                                                                         XIR3SQ-YAMPI*CS1RB*(X1R1-SN1RB))-R1*K*(XFTHLD+XMPHLD*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    1+YPRED(1+5)*CS-YPRED(1+6)*SN)+K*(XNUPT*XNTPH-XNTTH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (S**2*CS**2)-K*XFPHLD-(EPSITH*EPSIPH)*(X]*XFPHL1+X2*
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     +YAMPI + TAN/S + + 2 - K + ( X F T H L D + X M P H L D + TAN/S ) - ( Y D D T ( I + 4 ) +
                                                                                                                                                                                                                                                                            XIR1#(YDØT(1+5)-YPRCD(1+6))+YPRED(1+7)#(X1#SAVY(3)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         (XN*XMPHLD*X1RB-XFZELD)-K1*((EPSITH+EPSIPH)*(X1*
XFZEL1+X2*XFZEL2)+YPRED(1+7)*(X1*XFPHL1+X2*XFPHL2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            (X1*XFPHL1+X2*XFPHL2)+YA@PH*(X1*XFZEL1+X2*XFZEL2))-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     = (1.0/(XK22-XNUTP**2*XK11)) # (YPRED(I+1)-X NUTP*YANTH+
                                                                                                                        (XI*XFZEL1,+X2*XFZEL2))-R1*SN1RØ*(YAØPH*(X1*SAVY(1)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              R1*(YAMTH#CS1R0-YPRED(1+3)*CS1R8-2.0*XN*YAMPT*X1R0+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            -YPRED(1+2)/S-YANTH*TAN/S+XNSQ*YAMTH/(S**2*CS**2)
-2.0*XN*YAMPT/(S**2*CS)+K*(XN*XMPHLD*X1CS/S-XFZELD)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              YD&T(|+4)=(|.0/S)*(YPRED||+4)+XN*YPRED||+5)*X|CS+YAMPT*FN/XK33|
                         YAMPT#SNIRG/XK33)+R1#YA@PH#(X1#SAVY(3)+X2#SAVY(61)
                                                 RI#(-2.0*YPRED(1)*CS1RØ+XN*YANTH*X1RØ-XN*YAMTH*SN*
                                                                                                                                                                                                                                                                                                                                                     YAMPT*(SN*XIR@+XIRI))+YPRED(I+2)*XIRI)-R1*K*XFPHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             -(EPSITH+EPSIPH)*(X1*XFZEL1+X2*XFZEL2)-YPRED(I+7)*
                                                                                                SNIKE)-(YDET(I+4)*(KI*XFPHL]+X2*XFPHL2)+R1*YABPH*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         R1#(1.0/(XD22-XNUTP*#2#XD11))#(-YPRED(1+3)+XNUTP*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             K*(XNTPH-XNUTP*XNTTH))-YPRED(I+7)*(X1*SAVY(3)+X2*
                                                                                                                                                                                                                                                                                                                                                                                                                            RI# (-YPRED(1+2) *CSIRO-YANTH#SNIRO-YPRED(1+1) #X1R1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 -R] *X[RD*XN*(YANPT*(X] *SAVY(3)+X2*SAVY(6))-YABPH*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XICS#(XN#YPRED(I+4)#SN-XNSQ*YPRED(I+6))+YPRED(I+7)#CS)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                      +XNSQ &YAM TH# X1RBSQ-2.0 #XN#YAMPT #CS #X1RBSQ)+R1#K#
                                                                                                                                                                                                                                                XIR##(XN*YPRED(1+4)+YPRED(1+5)#CS-YPRED(1+6)#SN)
                                                                                                                                                                         RI*(YPRED([+6)*x[R]+(].0/(XK22-XNUTP**2*XK]]))*
                                                                                                                                                                                                                                                                                                                              RI*(CSIRD*(YANTH-YPKED(I+1))-XN*XIRU*(YPRED(I)+
                                                                                                                                                                                                 (YPREDILI+1)-XNUTP*YANTH+K*(XNTPH-XNUTP*XNTTH)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            (1.0/(S*CS)) + (XN*YPRED(I+4)+CS*YPRED(I+5)-SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     . +YPRED(1)/XK33+YA0PH*(X1*SAVY(3)+X2*SAVY(6))
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                                                                                                                                                  X2*SAVY(4))-YANPT*(X1*SAVY(3)+X2*SAVY(6)))
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                                                                                                                                                                                                                             -K1*YPRED(1+7)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    = XN*YPRED(I+6)*X1CS/S-YPRED(I+4)*TAN/S
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                                                                                                                                                                                                                                                                                                                                                                                                    K* (XMTTH-XNUPT * XMTPH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      * YPRED(I)+YAMPT*TAN/S
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6)*SN)-(XC11+XK12*XC22*XD21/XD22*(1,0)(XK22+XC22*XC22*)))*
                                                                                                                                                                                                                                                                              YAMTH=XNUPT+YPRED{1+3}-{X1R0*(XD11-XNUPT+*2+XD22)}*(X1R0*(XN+YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            X2*XFZEL2))-X1R0*(YA0PH*(X1*SAVY(1)+X2*SAVY(4))-YANPT*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       (X1 + SAVY(3) + X2 + SAVY(6)) - YABPH+(X1 + SAVY(1) + X2 + SAVY(4)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  (XIRB**2*(XN*YPRED(I+4)*SN-XN**2*YPRED(I+6))+YPRED(I+7)*CS*
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -K*XMTTH+XD12*(XK22/(XC22*#2+XK22#XD22)) *(YPRED(I+3)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            - EQUATIONS FOR SHELLS OF REVOLUTION ( PHI COORDINATE )
771 YANTH = XK12*(1.0/(XK22+XC22**2/XD22))*(YPRED(I+1)+K*XNIPH+
I (XC22/XD22)*(YPRED(I+3)+K*XMIPH))-K*XNITH+(XIRO*XKII-
                                                                                                                                                                                                                              YANTH=XNUPT*YPRED(I+1)+(XKII-XNUPT**2*XK22)*(XIRG*(XN*YPRED(I+4)-
                                                                                                                                                                                                                                                                                                                                                       YAMPT=(-1.0%((RØ/XO33)+(X1RØ/XK33))))*(-2.0*XN*YPRED(1+7)+XN*X1RØ*
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                                               YAMTH/S-YPRED(I+3)/S-2.0 + XN + YAMPT/(S + CS) + YAJPH+XMTHLO
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EPS]PH)*(X]*XFPHL]+X2*XFPHL2)+YPRED(I+7)*(X]*XF2EL]+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                (+4)+YPRED(1+5)+CS-YPRED(1+6)+SN)+(XD11-XD12+XK22+XD21/(
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XN#YANTH#X1R0-XN#YAMTH#X1R0SQ-K#(XFTHLD+XMPHLD#X1R0)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -(YOBT(1+4)*(X1*XFPHL1+X2*XFPHL2)+YABPH*(X1*XFZEL1+
(X1 # XFPHL 1 + X2 # XFPHL2) - X1 CS/S#XN# (YANPT # (X1 # S AVY (3) +
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                                                                                                                      YDØT(1+7)=(1.0/(XD22-XNUTP**2*XD11))*(-YPRED(1+3)*XNUTP*YAMTH-
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                          X2#SAVY(6))-YABPH#(X1#SAVY\1)+X2#SAVY(4)))
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            YPRED(1+6)*SN)-(*C11+(*K12*XD21*XC22/XD22)*(1.0/(*K22+XC22*
*2/XD22)))*((1.0/($**2*C5**2))*(*N*YPRED(1+4)*SN-XNSQ*YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -R1*((EPSITH+EPSIPH)*(X1*XFPHL1+X2*XFPHL2)-YPRED(I+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              XD21/(XC22**2+XK22*XD22))*(X1RBSQ*(XN*YPRED(I+4)*SN-XNSQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (XC22/XD22)*(YPRED(1+3)+K*XMTPH))-K*XNTTH+(1.0/(CS*S))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          xD21/(XC22**2+XK22*XD22))*((1.0/(S*CS)**2)*(XN*YPRED(I+4)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         YPRED(I+4)*SN/S+XN*YPRED(I+5)*TN/S+2.0*XN*YPRED(I+6)/S+YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   YPRED(1+4)+YPRED(1+5)*CS-YPRED(1+6)*SN)-(XC22*XD21/XD22
                                                                                                                                                                                                 RI*(YPRED(I+4)*CSIR0+XN*YPRED(I+5)*XIR0+YPRED(I)/XK33+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              = RI#(YPRED([+6)*XIRI-YPRED([+7)*(X]*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            +(xK22/(xC22**2+XK22*XD22))*(YPRED(1+3)+K*XMTPH)-(XK22*
                                                                                                                                                                                                                                                                                  XIRBSQ-YAMPT*CSIRB*(XIRI-SNIRB))-RI*K*(XFTHLD+XMPHLD*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              -K*XMTIH+XD12*(XK22/(XC22**2+XK22*X022))*(YPRED(1+3)+
                                                                                                                                                                                                                                                                                                                                                                                                                            +(1.0/(XK22+XC22*#2/XD22))#(YPRED(I+1)+K#XNTPH+(XC22/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 = -xD12*(XC22/(XC22**2+XK22*XD22))*(YPRED(I+1)+K*XNTPH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |S+CS)+XD12*XK21/(S+CS))+(XC22/(XC22*+2+XK22*XD22))+(XN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             YPRED(1+4)+YPRED(1+5)*CS-YPRED(1+6)*SN)+(XD11-XD12*XK22*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          = R1*({-XC22/(xC22**2+XK22*XD22))*(YPRED(I+1)+K*XNTPH-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YAMPT=(-1.0/((S*CS/XD33)+(SN*TN/(XK33*S))))*(-2.0*XN*YPRED(1+7)-
                                                                                                                                                                                                                                                                                                                                          (XI * XFZEL I + X2 * XFZEL?)) - RI * SNIRØ * (YAØPH * (XI * SAVY (I) +
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                X1R1*(YDØT(I+5)-YPRED(I+6))+YPRED(I+7)*(X1*SAVY(3)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            +XNSG*YAMTH*XIROSQ-2.0*XN*YAMPT*CS*XIROSQ)+RI*K*
(XN*XMPHLO*XIRO-XFZELD)-RI*((EPSITH*EPSIPH)*(XI*
XFZELI+X2*XFZEL2)+YPRED(I+7)*(XI*XFPHL1+X2*XFPHL2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        YDQT([+3) = R1*(YAMTH*CS1R0-YPRED(I+3)*CS1R0-2.0*XN*YAMPT*X1R0+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  = XK12*(1.0/(XK22+XC22**2/XD22))*(YPRED(I+1)+K*XNIPH+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ..O/(XK22+XC22**2/XD22)))*(XN*YPRED(I+4)+YPRED(I+5)*CS-
                             YPRED(I+7)+YPRED(I+4)*(CSIR1-CN1R0)+XN*YPRED(I+5)*
                                                                                                                                                                                                                                                     RI*(-2.0*YPRED(I)*CSIRO+XN*YANTH*XIRO-XN*YAMTH*SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YAMPT*(SN*X1R0+X1R1))+YPRED(1+2)*X1R1)-R1*K*XFPHLD
                                                                                                                                                                                                                           YAMPT#SN1 RØ/XK33)+R1 #YABPH# (X1#SAVY (3)+X 2#SAVY (6))
                                                                                                                                                                                                                                                                                                             SN1R0)-(YUBT(I+4)*(X1*XFPHL1+X2*XFPHL2)+R1*YABPH*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   -RI#XIR@#XN#(YANPT#(XI#SAVY(3)+X2#SAVY(6))-YA@PH#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    # RI#(-YPKED(I+2)#CSIRØ-YANTH#SNIRØ-YPRED(I+1)#XIRI
                                                       |SN1RB+X1R1)+2.0+XN+YPRED(I+6)+CS1RB+YPRED(I)+SN/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     = X1R0*(XN*YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)*SN)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       = R1*(CS1R0*(YANTH-YPRED(1+1))-XN*X1R0*(YPRED(1)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 RØ)*(XN*YPRED(1+4)+YPRED(1+5)*CS-YPRED(1+6)*SN))
                                                                                                                 YPRED(I+2)-YPRED(I+1)*(X1*SAVY(3)+X2*SAVY(6))
     I-1.0/((RB/XD33)+(SNSQ*X1RB/XK33)))+(-2.0*XN*
                                                                                                                                                                                                                                                                                                                                                                       X2*SAVY(4))-YANPT*(X1*SAVY(3)+X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                         XD22) # (YPRED (1+3) + K # XMTPH) - XK21 # X1R Ø # (XN #
                                                                                       KK33+SN*YABPH*(X1*SAVY(3)+X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  = XN#YPRED(I+6)*X1CS/S-YPRED(I+4)*TAN/S
                                                                                                                                            -YPRED(:I+7) + (X] +SAVY (2) +X2 +SAVY (5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   *YPREU(I+6))+YPREU(I+7)*CS*X1RB))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               = R1*(YPRED(I+7)-YPRED(I+5)*X1RI)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             (X1 * XF ZEL 1 + X2 * XF ZEL?))
                                                                                                                                                                      YPRED(I)+YAMPT#SNIRØ
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                                                                                                                                                        =-2.0*YPRED(I)/S+XN*YANTH*XICS/S-XN*YAMTH*SN*XICS**2/S**2
                                                                                                                                                                                                                                                                                             -YPRED(1+7)*(X1*SAVY(3)+X2*SAVY(6))+(1.0/(XK22+XC22**2
                                                                                                                                                                                                                                                                                                                                                                           I+5) #CS-YPRED(I+6) #SN) - (XC22 #XD2I/X022) #((I.0/(S##2#CS##
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             (XC22/XU22)*(YPRED([+3)+K*XMTPH))-K*XNTTH+(X1RØ*(XK11-
                                                                                                                                                                                                                                         IAN/S*(YABPH*(X1*SAVY(1)+X2*SAVY(4))-YANPT*(X1*SAVY(3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (1+4)-YPRED(1+6))+(XD11-XD12*XK22*XD21/(XC22**2+XK22*XD22))+(X1R0SQ*(XN*YPRED(1+4)-XNSQ*YPRED(1+6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YDØT(I+7) = -(XC22/(XC22**2+XK22*XD22))*(YPRED(I+1)+K*XNTPH-XK21*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      +(XK22/(XC22**2+XK22*XD22))*(YPRED(I+3)+K*XMTPH)-(XK22*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -K*XMTTH+XD12*(XK22/(XC22**2+XK22*XD22)) *(YPRED(I+3)+
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YAMPT=(-1.0/((RB/XD33)+(X1R3/XK33)))#(-2.0#XN*YPRED(I+7)+XN#X1R3#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           XK12*XC22*XD21/XD22)*(1.0/(XK22+XC22*#2/XD22)))*(X1RØ*#2*(
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -X012*(XC22/(XC22**2+XK22*XD22))*(YPRED(I+1)+K*XNTPH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             YDBT(1+3)= YAMTH/S-YPRED(1+3)/S-2.0*XN*YAMPT/(S*CS)+YAJPH+XMTHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XN#YANTH#XIRB-XN#YAMTH#XIRBSQ-K#(XFIHLD+XMPHLD#XIRB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |S**2*CS**2)-K*XFPHLD~(EPSITH+EPSIPH)*(X1*XFPHL1+X2*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             -YPRED(I+1)/S+YANTH/S-XN+YPRED(I)/(S+CS)-XN+YAMPT+SN/
                                                                                                                                                                                                        (X1 * XFPHL1+X2 * XFPHL2) + YABPH * (X1 * XFZEL1+X2 * XFZEL2))-
                                                                                                                                                                                 +YAMPI*IAN/S**2-K*(XFTHLD+XMPHLD*TAN/S)-(YD@T(I+4)*
                                                                                                                                                                                                                                                                                                                      /XD22))*(YPRED(I+1)+K*XNTPH+(XC22/XD22)*(YPRED(I+3)
                                                                                                                                                                                                                                                                                                                                                                                                  2))*(XN*YPRED([+4)*SN-XNSQ*YPRED([+6))+YPRED([+7)/S))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -2.0*XN*YAMPI/(S*#2*CS)+K*(XN*XMPHLD*XICS/S-XFZELD)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    X1*XFPHL1+X2*XFPHL2)-X1CS/S*XN*(YANPT*(X1*SAVY(3)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             = XK12*(1.0/(XK22+XC22**2/XD22))*(YPRED(I+1)+K*XNTPH+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  XK22+XC22**2/XD22))))*(XN*YPRED(1+4)-YPRED(1+6))-(XC11+(
                                                                                                    YDØT(1+4)=(1.0/S)*(YPRED(1+4)+XN*YPRED(1+5)*X1CS+YAMPT*TN/XK33)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           EPSITH+EPSIPH)*(X1*XFZEL1+X2*XFZEL2)-YPRED(I+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         -YPRED(I+2)/S-YANTH*TAN/S+XNSQ*YAMTH/(S**2*CS**2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             YPRED(11+5)+YPRED(1)/XK33+YABPH*(X1#SAVY(3)+X2#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                YD@T([+4)=XN*YPRED([+5)*X1R&+YPRED([)/XK33+YAMPT*X1RB/XK33
[ ] + SN/XK33+SN*YABPH* (X1 *SAVY (3) +X2*SAVY (6) ) )
                                                                                                                                                                                                                                                                                                                                                                                                                             = (1.0/(S*CS))*(XN*YPRED(1+4)+CS*YPRED(1+5)-SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)*SN)/(S*CS))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  = YPRED(I+2)-YPRED(I+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                  +K*XMTPH)-(XK21/(S*CS))*(XN*YPRED(I+4)+YPRED(
                         YPRED(I+2)-YPRED(I+1)+(X1*SAVY(3)+X2*SAVY(6)
                                                                                                                          +YPRED(1)/XK33+YA@PH*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    = YDØT([+5]+YPRED([+7] *(X] *SAVY(3)+X2 *SAVY(6])
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    (2*SAVY(6))-YABPH*(X1*SAVY(1)+X2*SAVY(4)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XFPHL2)+YPRED(I+7) + (X1 + XF2EL1+X2 + XF2EL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -YPREU(1+7) * (X1 * SAVY (2) + X2 * SAVY (5))
                                                    -YPRED(1+7)*(X1*SAVY(2)+X2*SAVY(5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         = XIRØ*(XN*YPRED(I+6)-YPRED(I+4))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -XN**2*YPRED(1+6))+YPRED(1+7)/S)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XN*YPRED(1+4)-XNSQ*YPRED(1+6)))
                                                                             = YPRED(I)+YAMPT#TAN/S
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    = YPRED(I) +YAMPT *XIRB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XK12#XK21#(1.0/(
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                                                                                                                                                                                                                                                                       +X2*SAVY(6)))
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YPRED(I+7)*(XI*XFPHL1+X2*XFPHL2)-XIRØ*XN*(YANPT*
(XI*SAVY(3)+X2*SAVY(6))-YAØPH*(XI*SAVY(I)+X2*SAVY(4)))
                                                                 -YPRED(I+7)*(X1*SAVY(3)+X2*SAVY(6))+(I.o/(XK22+XC22**2/XD22))*(YPRED(I+1)+K*XNTPH+(XC22/XD22)*(YPRED(I+3)+K*XMTPH)-(XK21+X1R0)*(XN*YPRED(I+4)-YPRED
                        X2*XFZEL2))-X1R0*(YA0PH*(X1*SAVY(1)+X2*SAVY(4))-YANPT*
                                                                                                                                                                                                                                                                                                                                                                                                                                            YDØT(1+7) = -(XC22/(XC22*2+XK22*XD22))*(YPRED(1+1)+K*XNTPH-XK21*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XN*YPRED(1+4)-YPRED(1+6)))+(XK22/(XC22**2+XK22*XD22))*(
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              YPRED(1+3)+K*XMTPH)-(XK22*XD21/(XC22**2+XK22*XD22))*(
                                                                                                                                                                                                                                                     EPSIPH) * (X1 * XFPHL1+X2 * XFPHL2)+YPRED(I+7) * (X1 * XFZEL1+
  -(YD@T(I+4)*(X1*XFPHL1+X2*XFPHL2)+YA@PH*(X1*XFZEL1+
                                                                                                                                                                                                         EPSIPH = YDØT(I+5)+YPRED(I+7)*(XI*SAVY(3)+X2*SAVY(6))
YDØT(I+1) = -XN*XIRØ*YPRED(I)-XN*YAMPT*XIRØSQ-K*XFPHLD-(EPSITH+
                                                                                                                                       (I+6))-(XC22*XD21/XD22)*(X1RBSD*(XN*(YPRED(I+4)-XN*YPRE
                                                                                                                                                                                                                                                                                                     -YANTH#X1R0+XNSQ#YAMTH#X1R0SQ+K#(XN#XMPHLO#X1R0-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      XIRDSQ#(XN*YPRED(I+4)-XNSQ*YPRED(I+6)))
                                                                                                                                                                                                                                                                                                                                                                                              YDØT(I+3) = -2.0*XN*YAMPI*XIRØ+YAJPH+K*XMTHLD
                                                                                                                                                                                     = XIRB#(XN#YPRED(I+4)-YPRED(I+6))
                                             (X1*SAVY(31+X2*SAVY(6)))
                                                                                                                                                                 0(1(19+1)0
                                                                                                                                                                                                                                                                             X2*XFZEL2)
                                                                                                                                                                                                                                                                                                                                                                                                                      YDØT (1+6)=YPRED(1+7)
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                                                                   YDØT(1+5)
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EQUATIONS FOR SHELLS OF REVOLUTION ( PHI COORDINATE )
YANTH = (YPRED(1+1)+K*XNTPH)*(XCI5*XC22+XD22*XK12)/(XK22*XD22+
1 XC22*2)-K*XNTTH+(XK12*XC22-XK22*XC15)*(YPRED(1+3)+K*XNTPH)/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              6 XC15*(XK12*XD22+XK22*XD12)-XK12*XD12*XC22)/(XK22*XD22+XC22+XC22)/
YAMTH = (YPRED(1+3)+K*XMTPH)*(XC15*XC22+XK22*XD12)/(XK22*XD22+
1 XC22*XC22)+(YPRED(1+1)+K*XNTPH)*(XD22*XC15-XD12*XC22)/(XD22*XK22+
                                                                                                       DØUBLE PRECISIØN SAVTIC, TIC, PHI, STØP, RESTØP, RTICK
DØUBLE PRECISIØN YPRED
DØUBLE PRECISIØN YDØT, YASAVE, YANTH, YAMTH, YAMPT, YAJPH, S, SN, CS, SNSQ,
CSSQ, TAN, SEC, CN, XICS, XISN, TN, XIRØ, XIRØSQ, XISNRØ,
XICSRØ, CNIRØ, SNIRØ, CSIRØ, XIRI, XIRZ, CSIRI, CSIRZ,
SNIRI, XIRISQ, RZ, SQ, RØ, BESQ, RØSQ, XNSQ, RI, RZ, SI,
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                                                                                                                                                                                                                                                                                                                                                                                                              COMMON XN.TEFREE,TIC,PHI,STOP,RESTOP,RTICK,CI,XNL(2),NH
COMMON NST(30),NKL(30),NXMAT(20),SAVJTC(30),SAVSTP(30),JRTIC(30)
COMMON JRSTOP(30),NREG,NMPT,NRC,NSC,NIX,IERROR,KGEOM,IGEOM,ISTTAB
COMMON KELVIN,IBEGIN,NPROB,NSEG,NERROR,Q,THICK,NOJS,NLINKS,NLCASE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XMTHLO,XMPHLD,ETHET(2),EPHI(2),XGPT(2),ALPHTH(2),ALPHPH(2),DUM,
XNUTP,XNUP1,XC11,XC22,XC15,XO33,XD22,XD21,XD12,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   XD22}}/{xG22#XC22+XK22#XD22})+X]RØ#(XN#YPRED(I+4)+YPRED(I+5)#CS-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             3 YPRED(1+6)*SN)*[XK]1+(XC]5*(XC]5*XK22-2.0*XK]2*XC22)-XK12*XK]2*
4 XD22)/(XK22*XD22+XC22*XC22))+(XIRØSQ*(XN*YPRED(1+4)*SN-XNSQ
5 *YPRED(1+6))+XIRØ*YPRED(1+7)*CS)*(-XC]1+(XC]5*XCJ5*XC22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  XIRD, XIRDSO, XISNRO, XICSRO, CNIRO, SNIRO, CSIRO, XIRI, XIRI, XIRI, CSIRZ, SNIRI, XIRISO, RZSO, RO, BESO, ROSO, XNSO, BETA, RI, RZ, SI, RIDOI, XMTH, XMTH, XHTHLO, XFPHLD, XFZELD,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YPRED(I+6)*SN)*(XC11+(XD12*XC22*XK12-XC15*(XC15*XC22+XD12*XK22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  IF (KGEDM.EQ.1.0R.KGEDM.EQ.2.0R.KGEDM.EQ.5.0R.KGEDM.EQ.6) IGEDM
IF (KGEDM.EQ.3) IGEDM=2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             X1R0+YPRED(1+7)+CS)+(XD11-(XD12+XD12+XK22+XC15+(2-0+XC22+XD12-
                                                                                                                                                                                                                                                                             RIDGI, XNTTH, XNTPH, XMTTH, XMTPH, XC11, XC22, XC15,
                                                                                                                                                                                                                                                                                                         X033, XD22, XD21, XD12, XK11, XK12, XK21, XK22, XK33,
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             S, SN, CS, SNSQ, CSSQ, TAN, SEC, CN, X1CS, X1 SN, TN,
                                                                                                                                                                                                                                                                                                                                                          CØMMØN STØRY(16),XMAT(110,10),STØ(10),SADUS(30),RADUS(30)
CØMMØN TADUS(30),UADUS(30),SAVTIC(900)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      2 (XC22#XC22+XK22#XD22)+X1RB#(XN#YPRED(1+4)+YPRED(1+5)#CS-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           COMMON NISKL,NZ,NBCT,LINPUT,NTRKL,NPASS,XNI,KBC,NRINGS
COMMON /EQUAZN/ YPRED(80),YDØT(80),YASAVE(80),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XNPHI, M, I, BETTA, ZETTA, SAVY (8), XC16
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     ** ABACUS UPDATED 07/07/72
                            SUBROUTINE DIFF2 (XFPHL1, XFZEL1, XFPHL2, XFZEL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ANTH, YAMTH, YAMPT, YAJPH,
                                                                                                                                                                                                                                                                                                                                   XD11, XNPHI, BETA, XC16
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                                                        INTEGER SAVJTC, SAVSTP, Q, THICK
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                                                                                  INTEGER XNI, XN
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         -R1*((EPSITH+EPSIPH)*(X1*XFPHL1+X2*XFPHL2)-YPRED(I+7)*.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XC22**2)-K#XMITH+[1.0/(S*S#CSSQ)*(-XNSQ*YPREO(1+6)+XN*YPREO(1+4)*
SN)+YPREO(1+7)/S)*(XD11-(XD12*XD12*XK22+XC15*(2.0*XC22*XD12-XC15*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   YPRED(!+6))+x1R0*YPRED(!+7)*CS)*(XC22*XD12-XC15*XD22))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  6 XC15*(XK12*XD22+XK22*XD12)-XK12*XD12*XC22)/(KK22*XD22+XC22))
YAMTH = (YPRED(1+3)+K*XMTPH)*(XC15*XC22+XK22*XD12)/(XK22*XD22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       = (YPRED(I+1)+K*XNTPH)*(XC15*XC22+XD22*XK12)/(XK22*XD22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |+(XN*YPRED(]+4)+YPRED(]+5)+CS-YPRED([+6)+SN)+(XK12+KC22-XK22+XC15)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 YAMPI =((XC16+TAN/S-XK33-(TAN/S)+(XD33+TAN/S-XC16))++(-1))+((XK33+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XD33-XC16**2)*(1.0/(S*CS))*(-2.0*XN*YPRED(I+7)-YPRED(I+4)*
                           [+6) #C S#XIR@)+YA@PH#SN#(XI#SAVY(3)+X2#SAVY(6))+YPKEO(I)#
                                                                                                                                                                                                                                                                                                 XIROSO-YAMPT*CSIRØ*(XIRI-SNIRØ))-RI*K*(XFTHLD+XMPHLD*
                                                                                                                                                                                                                                                                                                                                                                                                                                             (XD22*(YPRED(I+1)+K*XNTPH)+XC22*(YPRED(I+3)+K*XMTPH)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      1 XC22++21+(YPRED(I+1)+K+XNTPH)+(XD22+XC15-XD12+XC22)/IXD22+XK22+
                                                                                                                                                                          = R1*(YPREU(1+4)*CS*X1R0+YA0PH*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                  YPRED(I+6)-R1*YPRED(I+7)*(X1*SAVY(3)+X2*SAVY(6))+R1*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         2-(XIKØSC*(XN*YPRED(I+4)*SN-XNSQ*YPRED(I+6))+XIRØ*YPRED(I+7)*CS)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YPRED(I+6) # SN) # (XC11+(XD12*XC22*XK12-XC15*(XC15*XC22+XD12*XK22+
CS*XIRI-CNIRJ)+XN*YPRED(I+5)*(XIRI+SNIRB)+2.0*XN*YPRED
                                                                                                                                                                                                                                       XC16**2/XD33))*(YPRED(I)+YAMPT*(SN*X1R0-XC16/XD33)))
                                                                                                                                                                                                                                                                                                                                                     (XI * XFZEL 1 + X2 * XFZEL2)) -R1 * SNIRB * (YABPH * (X1 * SAVY (1) *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        X1R1 # (YU@T(1+5) - YPRED(1+6)) + YPRED(1+7) # (X1 # SAVY(3) +
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           XF2EL1+X2*XF2EL2)+YPRED(1+7)*(X1*XFPHL1+X2*XFPHL2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              YD81(1+3) = R1*(YAM1H*CS1RB-YPRED(1+3)*CS1RB-2.0*XN*YAMPT*X1RB+
                                                                                                                                                                                                                                                                   = R1+(-2.0+YPKED(I)+CSIR0+XN*YANTH*X1R0-XN*YAMTH*SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       (XK12*X022+XC15*XC22)-(X1RØSQ*(XN*YPRED(1+4)-XNSQ*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YAMPI#(SN#XIR@+XIRI))+YPRED(I+2)+XIRI)-R1#K#XFPHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    {XC22*XC22+XK22*XD22}+{XN*YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)
                                                                                                                                                                                                                                                                                                                            SNIRB)-(YUBT (I+4)*(XI*XFPHLI+X2*XFPHL2)+RI*YABPH*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            X1R0*(XN*YPRED(1+4)+YPRED(1+5)*CS-YPRED(I+6)*SN)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   RI*(-YPRED([+2)*CSIRØ-YANTH*SNIRØ-YPRED(I+1)*XIRI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -R1 *X1R3 *XN * (YANPT * (X1 * SAVY (3) + X2 * SAVY (6)) - YABPH *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 rD&T([+7] = R1#(XK22#(YPRED([+3)+K#XMTPH)-XC22#(YPRED(I+1)+K#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YPRED(1+61)/15*5*CSSQ)+YPRED(1+7)/S)*(-XC11+(XC15*XC15+XC22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               #SN)/(S#CS)#(XK11+(XC15#(XC15#XK22-2.0#XK12#XC22)-XK12#XK12#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        XC22**2)-K*XNTTH+(XK12*XC22-XK22*XC15)*(YPRED(I+3)+K*XMTPH)/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 +XNSQ+YAMTH+X1RBSQ-2 .O+XN+YAMPT+CS+X1RBSQ1+R1+K+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             (XN*XMPHLO*X1RB-XF2ELD)-R1*((EPSITH+EPSIPH)*(X1*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             XIRE# (XN#YPRED(1+4)+YPRED(1+5)#CS-YPRED(1+6)#SN)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  RI*(CSIRU*(YANTH-YPRED(I+1))-XN*XIRD*(YPRED(I)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    X022))/(XC22*XC22+XK22*XD22))+1.0/(S*CS)*(XN*YPRED(I+4)+
                                                                                     = YPRED(I+2)-YPRED(I+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                      X2*SAVY(4))-YANPT*(X1*SAVY(3)+X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           XD22)/!XK22*XD22+XC22*XC22))+!!XN*YPRED!]+4)*SN-XNSQ*
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                                                                                                              -YPRED[1+7]*(X]*SAVY(2]+X2*SAVY(5])
                                                                                                                                                                                                           +XN*YPRED(I+5)*X1RØ+(1.0/(XK33-
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                                                         | XD334SN*X1R8-XC16))
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                                                                                                                                                                                                                        =-2.0*YPRED(I)/S+XN*YANTH*X1CS/S-XN*YAMTH*SN*X1CS**2/S**2
                                                                                                                                                                                                                                                                                                          IAN/S*(YABPH*(X1*SAVY(1)+X2*SAVY(4))-YANPT*(X1*SAVY(3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             = (YPRED(1+1)+K*XNTPH)*(XC15*XC22+XD22*XK12)/(XK22*X022+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      6 XC15+(XK12+XD22+XK22+XK12)-XK12+XD12+XC22)/(XK22+XD22+XC22+XC22))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                = (YPRED(1+3)+K*XMTPH)*(XC15*XC22+XK22*XD12)/(XK22*XD22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 YD01(1+7) = \{XK22*(YPRED(1+3)+K*XMTPH)-XC22*(YPRED(1+1)+K*XNTPH)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         AMPT=(1/(XC16*X1R0-XK33-X1R0*(XD33*X1R0-XC16)))*((XK33*XD33-XC16
                                                                                                                                                                                                                                                                                                                                                                 = -YPRED(I+7)*(XI*SAVY(3)+X2*SAVY(6))+(XD22*(YPRED(I+1)
                                                                                                                                                                                                                                                                                                                                                                                                                      XD22+XC15+XC22)+(1.0/(S*CS)+(XN*YPRED(1+4)+YPRED(1+5)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YPRED(I+6)+XN*YPRED(I+4)*SN)/(S*S*CSSQ)+YPRED(I+7)/S))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YD0T(1+3)= YAMTH/S-YPRED(1+3)/S-2.0*XN*YAMPT/(S*CS)+YAJPH+XMTHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           1 XC22**2)+(YPRED(I+1)+K*XNTPH)*(XD22*XC15-XD12*XC22)/(XD22*XK22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      **2)*X]RØ*(-2.0*XN*YPREU(]+7)+XN*X]RØ*YPRED(]+5))+YAØPH*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (S##2#CS##2)-K#XFPHLO-(EPSITH+EPSIPH)#(X1#XFPHL1+X2#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    -YPRED(I+1)/S+YANTH/S-XN*YPRED(I)/(S*CS)-XN*YAMPT*SN/
                                                                                                                                                                                                                                                     +YAMPT*TAN/S**2-K*(XFTHLD+XMPHLD*TAN/S)-(YDØT(1+4)*
                                                                                                                                                                                                                                                                             SN/S+XN*YPRED(I+5)*TAN/S+2.0*XN*YPRED(I+6)/S)+YABPH*SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   -2.0*XN*YAMPT/(S**2*CS)+K*(XN*XMPHLD*X1CS/S-XFZELD)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -(EPSITH+EPSIPH)*(X1*XFZEL1+X2*XFZEL2)-YPRED(I+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YPRED(I+5)*CS-YPRED(I+6)*SN))-(XC15*XC22+XK22*XD12)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YPRED(1+6))*(XK11+(XC15*(XC15*XK22-2.0*XK12*XC22)-XK12*XK12*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    YPRED(1+6))*(XC11+(XD12*XC22*XK12-XC15*(XC15*XC22+XD12*XK22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XC22**2)-K*XNTTH+(XK12*XC22-XK22*XC15)*(YPRED(I+3)+K*XMTPH)/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -YPRED(1+2)/S-YANTH#TAN/S+XNSQ#YAMTH/(S##2#CS##2)
                          X1+SAVY(3)+X2+SAVY(6))+YPRED(I)+(XD33+TAN/S-XC16))
                                                                                                                                                                                                                                                                                                                                                                                                                                                 CS-YPRED(I+6) * SN))-(XC22 * XD12 - XC15 * XD22) * ((-XNSQ*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              (XKI2*XC22-XK22*XC15)*(1.0/(S*CS)*(XN*YPRED(I+4)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ((-XNSQ*YPRED(I+6)+XN*YPRED(I+4)*SN)/(S*S*CSSQ)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                (X1 * SAVY (3) + X2 * SAVY (6) ) + YPRED (1) * (XD33 * X1RB - XC16))
                                                                                                                                 YDØT(I+4) = YPRED(I+4)/S+YAØPH#(X1#SAVY(3)+X2*SAVY(6))+XN*
YPRED(I+5)/(S#CS)+(1.«)/(XK33-XC16**2/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      XD22)/(XK22*XD22+XC22*XC22))+(X1R@SQ*(XN*YPRED(I+4)-XNSQ
                                                    YPRED(I+2)-YPRED(I+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     = (1.0/(S*CS))*(XN*YPRED(I+4)+CS*YPRED(I+5)-SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          = YPRED(1+2)-YPRED(1+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YDØT(I+5)+YPRED(I+7)*(X1#SAVY(3)+X2#SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XC22+#2)-K#XMTTH+X1RBSQ#(XN*YPRED(I+4)-XNSQ#YPRED(I+6))
                                                                                                                                                                                                                                                                                                                                                                                              +K+XNTPH)+XC22*(YPRED(I+3)+K*XMTPH)-(XK12*
                                                                                                                                                                                              XD33))*(YPRED(I)+YAMPT*(TAN/S-XC16/XD33))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (2*SAVY [6])-YABPH*(X1*SAVY(1)+X2*SAVY(4)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XFPHL2)+YPRED(I+7)*(X1*XFZEL1+X2*XFZEL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          X02211/(XC22*XC22+XK22*X0221)+XIRØ*(XN*YPRED(I+4)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               *(XD11-(XD12*XD12*XK22+XC15*(2.0*XC22*XD12-XC15*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     -YPRED(1+7)*(X1*SAVY(2)+X2*SAVY(5))
                                                                               -YPRED(I+7)*(X1*SAVY(2)+X2*SAVY(5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                YPRED(I+7)/S))/(XK22*XD22+XC22*XC22)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    (XC22*XC22+XK22*XD22)+X1RB*(XN*YPRED(1+4)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              = X1R0*(XN*YPRED([+6)-YPRED([+4))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         *YPRED(1+6)))*(-XC11+(XC15*XC15*XC22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    6 XD22*XK12))/(XC22*XC22+XK22*XD22))
                                                                                                         YPRED(I)+YAMPI*TAN/S
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        /(XK22*XD22+XC22*XC22)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YPRED(I)+YAMPT#X1RØ
                                                                                                                                                                                                                                                                                                                                          +X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YPRED(1+6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  EQUATIONS FOR CYLINDER
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       (DØT(I+1)=
                                                                                                                                                                                                                                                                                                                                                                 YDØT(I+5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YDØT(1+2)
                                                                                                                                                                                                                        YDØT(I)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     EPSITH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          EPSIPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YANTH
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              YABPH
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YANPT
                                                                                                         YANPT
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601860
601870
601880
601890
601900
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        602100
                                                                                                                                                                                                                                                                                                                                                                                                  YDØT(1+2) = -YANTH*XIRØ+XNSQ*YAMTH*XIRØSQ+K*(XN*XMPHLO*XIRØ-
XFZELD)-(EPSITH+EPSIPH)*(XI*XFZEL1+X2*XFZEL2)-
YPRED(1+7)*(XI*XFPHL1+X2*XFPHL2)-XIRØ*XN*(YANPT*
(XI*SAVY(3)+X2*SAVY(6))-YAØPH*(XI*SAVY(1)+X2*SAVY(4)))
                                                                        = XN*YANTH*XIRG-XN*YAMTH*XIRGSQ-K*(XFTHLD+XMPHLD*XIRG)
-(YOGI(I+4)*(XI*XFPHL1+X2*XFPHL2)+YA0PH*(XI*XF2ELI+
X2*XFZEL2))-XIRG*(YA0PH*(XI*SAVY(I)+X2*SAVY(4))-YANPI*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      1(xN&YPRED(11+4)-YPRED(11+6))*(XK12*XC22-XK22*XC15)-X1RØSG*(XN&YPRED
2(11+4)-XNSQ*YPRED(11+6))*(XC15*XC22+XK22*XD12))/(XC22**2+XK22*XD22)
                                                                                                                                                                                                                          1(XN*YPRED(1+4)-YPRED(1+6))*(XK12*XD22+XC15*XC22)-X1R0SQ*(XN*YPRED
                                                                                                                                                                              YD@T([+5] = -YPRED([+7]*(X1*SAVY(3)+X2*SAVY(6))+(XD22*(YPRED([+1)
                                                                                                                                                                                                                                                  2(I+4)-XNSQ*YPRED(I+6))*(XC22*XD12-XC15*XD22))/(XK22*XD22+XC22**2)
                                                                                                                                                                                                                                                                                                                                                    EPSIPH) *(X1 * XFPHL1 + X2 * XFPHL2) + YPRED(I+7) *(X1 * XFZEL1+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YD01(1+7) = {XK22*(YPRED(1+3)+K*XMTPH)-XC22*(YPRED(1+1)+K*XNTPH)
                                                                                                                                                                                                                                                                                                                               YDGT(I+1) = -XN*X1R0*YPRED(I)-XN*YAMPT*X1R0SQ-K*XFPHLD-(EPSITH+
YUBT(I+4) = (YABPH*(X1*SAVY(3)+X2*SAVY(6))+XN*YPRED(I+5)/RB)+
                                                                                                                                                                                                                                                                                                     = YD0T([+5)+YPRED([+7)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                     +K*XNTPH)+XC22*(YPRED(I+3)+K*XMTPH)-X1RB*
                         (1.0/(XK33-XC16**2/XD33))*(YPRED(1)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         YOUT([+3] = -2.0*XN*YAMPI#XIRB+YAJPH+K*XMTHLD
                                                                                                                                                                                                                                                                                = X1RØ*(XN*YPRED(I+4)-YPRED(I+6))
                                                                                                                                                       (X1 * SAVY(3) + X2 * SAVY(6)))
                                                   YAMPT*(X1RØ-XC16/X033))
                                                                                                                                                                                                                                                                                                                                                                                  X2*XF2EL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YDØT(1+6)=YPRED(1+7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           9005 CONTINUE
                                                                               YDØT(I)
                                                                                                                                                                                                                                                                                  EPSITH
                                                                                                                                                                                                                                                                                                          EPSIPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     RETURN
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SUBROUTINE SEGMAT

The results of the subroutine link, RIEMAN, are passed through the label common area, IXCORR, to this subroutine. SEGMAT places the elements of the YCORR array into several double-subscripted arrays, forms some coordinate transformation arrays, and calls subroutine SREVN2 for double precision matrix inversion.

As a result of appropriate matrix operations this subroutine produces a segment stiffness matrix, the XKS array, and a segment load matrix, the XLS array, for each segment. In passes other than the first pass, first cycle, the XLS array is not calculated. SEGMAT also orients each segment into the global coordinate system of the structure as a result of the matrix operations.

Subroutine SREVN2

SREVN2 is a subroutine called by SEGMAT to invert a real, double-precision, in-core matrix utilizing Gauss-Jordan elimination with partial pivoting.

SNI

SNJ

CSI

CSJ

A MATRIX

B MATRIX

C MATRIX

D MATRIX

E MATRIX

XKT MATRIX

XMAX MATRIX

XKS MATRIX

XLS MATRIX

si

sj

ci

сj

 $\begin{bmatrix}
IFT & 0 \\
0 & JFT
\end{bmatrix}$

 $\begin{bmatrix} 0 & | & I_{1_1} & | & 0 \\ \hline X_1 & | & X_2 & | & X_3 \end{bmatrix}$

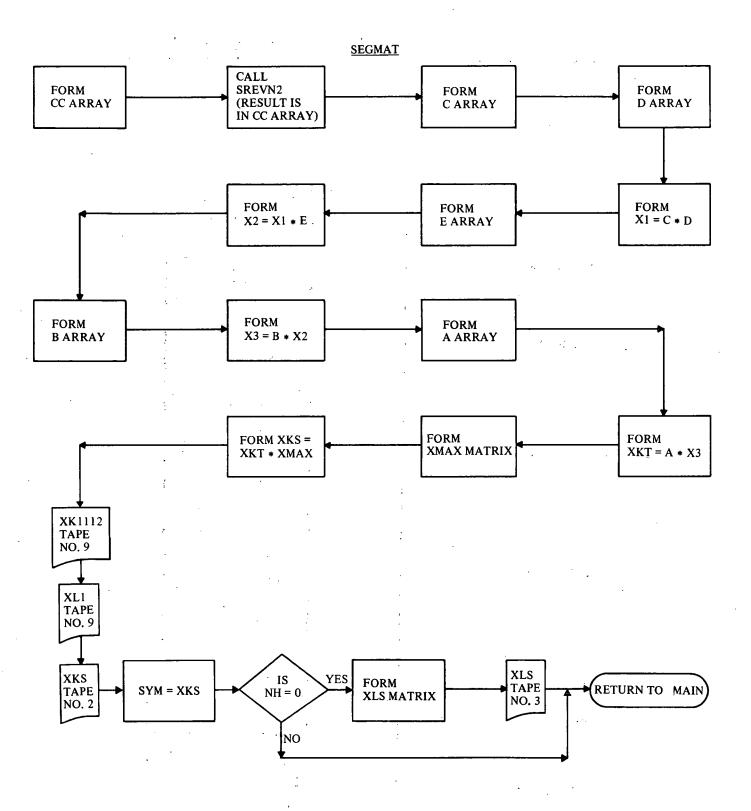
 $\begin{bmatrix} I_{1_{4}} & 0 & 0 & 0 \\ \hline 0 & 1 & Y_{2} & 0 & 0 \\ \hline 0 & 1 & 0 & 1 & 1 \\ \hline 0 & 1 & 0 & 1 & 1 \end{bmatrix}$

 $\begin{bmatrix} I_{1} & 0 & 0 \\ -Y_{1} & DT^{T} & -Y_{3} \\ 0 & 0 & 1 \end{bmatrix}$

 $\begin{bmatrix} IDT^{T} & 0 & 0 & 0 \\ \hline 0 & 1 & I_{1} & 0 & 0 \\ \hline 0 & 0 & 1 & 0 & 1 \end{bmatrix}$

[k | L]

 $\begin{bmatrix} 2\pi r_0(i) & | & | & | \\ -2\pi r_0(j) & | & | & | \end{bmatrix}$



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700110
700120
700130
                                                                                                                                                                                                                                                              700150
700160
700170
700180
700190
700200
700210
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                                                                                                                                     COMMON XN, TEFREE, TIC, PHI, STOP, RESTOP, RTICK, G1, XNL(2), NH
COMMON NST(30), NKL(30), NXMAT(20), SAVJTC(30), SAVSTP(30), JRTIC(30)
COMMON JRSTOP(30), NREG, NMPT, NRC, NSC, NIX, IERROR, KGEOM, IGEOM, ISTTAB
COMMON KELVIN, IBEGIN, NPROB, NSEG, NERROR, Q, THICK, NØJS, NLINKS, NLCASE
COMMON NISKL, NZ, NBCT, LINPUT, NTRKL, NPASS, XNI, KBC, NRINGS
                                                                                                                                                                                                                                                                                                                                                                     )
                                                                                                                                                                                                                                                                                                                                      EQUIVALENCE (LABEL( 1),NI(1)) , (LABEL( 3),NZ(1))

EQUIVALENCE (LABEL( 5),N3(1)) , (LABEL( 7),N4(1))

EQUIVALENCE (LABEL( 9),NS(1)) , (LABEL(111),N6(1))

EQUIVALENCE (C(1),E(1),X3(1),XMAX(1),XLS(1))

EQUIVALENCE (XZ(1),D(1),A(1),XMAX(1),XLS(1))

EQUIVALENCE (XZ(1),D(1),A(1),XKS(1)),(XI(1),B(1),XYT(1),SYM(1))

SIN(X) = DSIN(X)

CDS(X) = DCØS(X)
                                                                                                                                                                                                                 COMMON /LYCORR/ YCORR(80)
DIMENSION C(18,18),CC(4,4),D(18,18),E(18,18),B(8,18),A(8,8)
DIMENSION X1(18,18),X2(18,18),X3(8,18),XKT(8,18),XMAX(8,18)
DIMENSION XXS(8,18),XLS(8,2),SYM(8,18)
                                                           DØUBLE PRECISIØN SAVTIC,TIC,PHI,STØP,RESTØP,RTICK,YCØRR,AI
DØUBLE PRECISIØN C,CC,O,E,B,A,XI,XZ,X3,XKT,XMAX,XKS
OØUBLE PRECISIØN RI,RJ,CSI,CSJ,SNI,SNJ,XZPIRI,XZPIRJ,
CØMMØN STØRY(16),XMAT(110,10),STD110),SADUS(30),RADUS(30)
       •
                                                                                                                                                                                                                                                                                                              ,N4(2)
** ABACUS UPDATED 07/07/72
                                                                                                                                                                                                                                                                                                               ,N3(2)
                                                                                                                          COMMON TADUS (30), UADUS (30), SAVTIC (900)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   /8HFØRCE 11/
/8HFØRCE 21/
/8HFØRCE R1/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              /8HFØRCE 22/
/8HFØRCE R2/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               /8HMØMENT 1/
/8HFØRCE T2/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              'BHMØMENT 2/
                                                                                                                                                                                                                                                                                                               ,N2(2)
                               INTEGER SAVJIC, SAVSIP, Q, THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             IF (NH.EQ.0) WRITE(6,1726)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       GBTB (601,602,603), IGEBM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  CBS(1.570796-A1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               = SIN(1.570796-A1)
                                                                                                                                                                                                                                                                                                               N1(2)
N5(2)
                                                                                                                                                                                                                                                                               DIMENSION DEAD(4)
DIMENSION LABEL(16)
DIMENSION N1(2)
                  UBRBUTINE SEGMAT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SNI = SIN(TIC)
SNJ = SIN(STØP)
CSI = CØS(TIC)
 **D7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      CSJ = CBS(STBP)
                                                 INTEGER XN1, XN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          J=1,18
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       111 1=1,18
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             FORMAT(1H1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         0.0=([.11)
                                                                                                                                                                                                                                                                                                                                DIMENSION
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 = 1.0
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 DATA N6
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DATA N8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DATA N3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 DATA N7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    DATA N4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DATA N2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DATA NI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            (S) = (
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       v
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```
CC(I,J)=YCBRR(L)
CALL SREVNZ (CC,4,DEAD,4,NIX)
IF (NIX.NE.O) GBTB 8120
J1=0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XI(I,0)=X1(I,0)+C(I,M)*D(M,0)
                                                                                                                                                                                                                                                                                                                                                                                                                                                 D(I;J)= -YCØRR(L)
                                                                                                                                                                                                                                                                                        D(I+1)=1.0
D(I+1+I+1)=-SNJ
D(I+2,I+2)=-SNJ
D(I+3,I+3)=1.0
                                                                                                                                                                 C(I,1)=CC(II,1)
                                                                                                                                                                                                                                                                                                                                              D(I+2,I+1)=-CSJ

DØ 218 IJ=9,JJ

D(IJ,IJ)=1.0
                                                                                                                                                                                                                                                                                                                                     D(1+1,1+2)'= CS.
                                                                                                                                                                                                                                            D( [1, 1) = 0.0

D( 117 [J=1,4

D( [J, [J] = 1.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DØ 120 J=1,JJ
DØ 120 I=1,JJ
X1(I,J)=0.0
                                                                                                                                                                                        C(IJ, IJ)=1.0
DØ :115 IJ=9,JJ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DØ 119 J=9,JJ
K=K+8
                                                                                                                                                                              DØ 114 [J=1,4
                                                                                                                                                                                                            C([J,[J)=1.0

OØ 116 J=1,18

OØ 116 I=1,18
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 00 121 3=1,18
                                                                                                                                                                                                                                                                                                                                                                                                                          DØ 118 I=5,8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DØ 119 I=5,8
                                        00 112 1=1,4
                                                                                                        00 113 J=5,8
J1=J1+1
                                                                                                                                          00 113 1=5,8
        DØ 112 J=1,4
K=K+8
                                                                                                                                                                                                                                                                                                                                                                                           00 118 J=1,4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       E(I, 1)=0.0
                                                                                                                                                      11=11+1
                                                                                                                                                                                                                                                                                                                                                                                                        K=K+8
K=28.
                                                    1=1+1
                                                                                                                                                                                                                                                                                                                                                                                                                                        [=[+]
                                                                                                                                                                                                                                                                                                                                                                                                                                                             ¥=60
                                                                                                                                 0=11
                               L=K
                                                              112
                                                                                                                                                                                       114
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                                                                                                                                                                                                                                                                                                                                                                      218
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X2(1,J)=X2(1,J)+X1(1,M)*E(M,J)
                                                                                                                                                                                                                                                                                                                                                                                                                 100 129 J=1,JJ

100 129 1=1,8

X3(I,J)=0.0

100 129 M=1,JJ

X3(I,J)=X3(I,J)+8(I,M)*X2(M,J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   A(I+1,I+2)=CSI
A(I+2,I+1)=-CSI
A(I+3,I+3)=1.0
E(I+1,I+2)=CSI
E(I+2,I+1)=-CSI
DØ 122 J=5,JJ
                                                                                                                                                                                                                                                                                                                                                                                                     B(I, J)=YCORR(L)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          A(I+1,I+1)=-SNJ
A(I+2,I+2)=-SNJ
                                                                                                                                                                                                                                               H(1, J)=YCBRR(L)
                                                                                                                                                                                                                                                                                                                           B(1, J)=YCORR(L)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   A(1,1)=-1.0
A(1+1,1+1)=SNI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       A(1+2,1+2)=SNI
                                              00 123 J=1,JJ
00 123 I=1,JJ
                                                                 X2(1,1)=0.0
00 123 M=1,1J
                                                                                                                                             00 125 I=1,4
J=J+1
                                                                                                                                                                                                                                                                                                                                                 08 128 J=9,JJ
K=K+8
                                                                                                                                                                                                                                                                                                      DØ 127 I=5,8
                                                                                                                                                                                                                          00 126 1=5,8
L=L+1
                                                                                                                                                                                                                                                                     DØ 127 J=5,8
K=K+8
                                                                                                                                                                                                                                                                                                                                                                                 DØ 128 1=5,8
L=L+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DØ 130 J=1,8
DØ 130 I=1,8
                                                                                                                                                                                           DØ 126 J=1,4
K=K+8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         00 131 I=1,8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              A(1,1)=1.0
                                                                                                                                                                    B(1, J)=1.0
                                   F(J,J)=1.0
                                                                                                                          8(I+1)=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              130 A(1,J)=0.0
                                                                                                                                                                                                                                                            x = 24
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                                                                                                                                                                                                                                                                                                                                                                        781 FØRMAT(/////55x,22HSTIFFNESS CØEFFICIENTS//14x,8HDELTA T1,7x, 1 8HDELTA 21,7x,8HDELTA R1,7x,7HTHETA 1,8x,8HDELTA 12,7x,8HDELTA 22,7x,9HDELTA 2,7x,7HTHETA 2,7x,6HDELTA R2,7x,7HTHETA 2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           IF (NH.EQ.O.BR.IBEGIN.EQ.1) WRITE(6,23) (LABEL(I),1=II,III),
                                                                                                                                                                                                                                                                                                                                               IF (NH.EQ.0) WRITE(9) ((SYM(I,J),J=9,JJ),I=1,4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (XKS (M, J), J=1,8)
                                                                                                                                                                                                                                                                                                                                   WRITE(9) ((SYM(1,J),J=1,8),I=1,4),IGEDM,G1
                                                                                                                                                                                                                                                                                                                                                              IF (NH.EQ.O.ØR.IBEGIN.EQ.1) WRITE(6,781)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                9968 FØRMAT(1H ,8(E14.7,2X)/(5X,8(E14.7,2X)))
                                                                                                                                                                                                                                                                        XKS(I,1)=XKS(I,1)+XMAX(I,M)*XKT(M,1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               WRITE(2) ((SYM(I,J),J=1,8),I=1,8)
XKT(1,J)=0.0
00 131 M=1,8
XKT(1,J)=XKT((1,J)+A((1,M)*X3(M,J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        FØRMAT(/1X,2A4,1X,8(E14.7,1X))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              IF(XKS(1,J).GE.O.O)GB TB 138
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SYM(I,J)=XKS(I,J)
IF(INDEC.EQ.O)GB TB 151
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      IF (NH.NE.0) GØ TØ 151
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DØ 20 J=1,8
SYM(M,J) = 'XKS(M,J)
                                                                                                                                                                                                                                                                                                                     SYM(1,1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    I SEG=I SEG+NST(I)
                                                                                                  X2PIRJ=2.0*PI*RJ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                SAVTIC(1SEG)=TIC
                                                                      X2PIRI=2:0*PI*RI
                                                                                                                                                                          XMAX(1,1)=X2PIRI
                                                                                                                                                                                                     XMAX(J,J)=X2PIRJ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DØ 244 I=1,NRC1
                                                                                                                                                                                                                  J=1, JJ
                                                                                                                                             XMAX(I,1)=0.0
                                                                                                                                                                                                                                                                                         LL 139 J=1; JJ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    I SEG=I SEG+NSC
                                        PI=3.1415927
                                                                                                                  00 135 J=1,8
                                                                                                                                UB 132 I=1,8
                                                                                                                                                            00 133 I=1,4
                                                                                                                                                                                                                                             XKS(I, J)=0.0
                                                                                                                                                                                       DØ 134 J=5,8
                                                                                                                                                                                                                                                            DØ 135 M=1,8
                                                                                                                                                                                                                                                                                                      DØ 139 .I=1,44
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SYM(I, J)=0.0
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                                                                                      RJ=RESTØP
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            152 FØRMAT(///- ***************************** WARNING - NEGATI
IVES APPEAR BN MAIN DIAGONAL. REVISE SIZÎNG *************/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       IF (NH.EQ.O.0R.IBEGIN.EQ.1) WRITE(6,795) RTICK,RESTUP
FORMAT( /- RZERØ(1) =-,1PE15.6,10x,-RZERØ(J) =-,1PE15.6)
                                                                                                                                                                                                                                                                                                                                              FORMATI//55X, 22HSEGMENT SYMMETRY CHECK, )
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        FORMATI//55X, 22HSEGMENT LOAD MATRICES ,)
                                                                                                                                                                                                                                                                                                                IF (NH.NE.O.AND.IBEGIN.NE.1) GØ TØ 145
                                                                                                                           = ABS(SYM(I,J)) - ABS(SYM(J,1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                            WRITE(3)((XLS(I,J),J=1,NPRBB),I=1,8)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DØ 840 1=1,8
WRITE(6,9968)(XLS(1,J),J=1,NPRØB)
GØTØ 9999
                                                                                                                                                                                                                                                                                                                                                                       WRITE(6,9968) (SYM(I,J),J=1,8)
IF (NPRØB.EQ.0) GØ TØ 9999
DØ 136 J=1,NPRØB
                                                                                                                                         IF(ALPH) 47,71,48
IF(SYM(1,J).EQ.3.0) GBTB 71
SYM(1,J) = SYM(J,I) / SYM(I,J)
                                                                                                                                                                                                   IF(SYM(J,1).EQ.0.0) GBTØ 71
SYM(I,J) = SYM(I,J) / SYM(J,1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                XLS(1, J) = XKS( 1, J1)
                                                                                                                                                                                                                                              SYM(1,J) = 1.0
SYM(J,11.0 0.0
                                                                                   DØ 42 II=1,7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            WRITE (6,782)
                                                                                                                                                                                                                                                                                                                                                              DØ 144 I=1,8
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                                                                                                              I = M . N
WR ITE(6, 152)
                                                                                                                                                                                                                                                                                                                                  WRITE(6,785)
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                                                                                                                                                                                       GOTO 43
                                                                                                                                                                                                                                  GBTB 43
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                                                                                                               00 43
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                                         151 JJ=2
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SUBROUTINE REGMAT

The segment stiffness matrices, XKS, and the segment load matrices, XLS, are passed from SEGMAT to REGMAT via Tapes #2 and #3, and are placed in the XKRTOT array and the XLRTOT array, respectively. If kinematic links occur between segments in the region, the XKRTOT array and the XLRTOT array are modified to represent the situation. In the case of discrete rings the routine RINGER is called and provides the necessary matrices.

A horizontal and vertical partitioning of the XKRTOT array occurs while the XLRTOT array is subjected to a horizontal partitioning only. Appropriate matrix operations are performed upon the partitions of each array, thus reducing the size of the region stiffness and load matrices and resulting in increased program capacity. The results of these manipulations are the region stiffness matrix, XKR, and the region load matrix, XLR. In passes other than the first pass, first cycle, the load calculations are not performed.

Subroutines Called from REGMAT

<u>Subroutine SWITCH</u>: Is a routine used to arrange a matrix in a form convenient for use by another routine employing a positive definite method for solving linear algebraic equations.

Subroutine CHASE: Is a routine used to obtain the solution X of the linear system AX = Y, given at least one right side of Y and the positive, definite, symmetric, real coefficient matrix A.

Subroutine FUTILE: Is a routine called from CHASE and used to obtain the factorization of the positive definite, real, symmetric matrix A into the product of a lower triangular matrix and its transpose by utilizing a Cholesky decomposition.

Subroutine TRIEQ: Is a routine called by CHASE or EIGVAL to solve a triangular system of algebraic equations.

FORTRAN	CODE
LOUTDAN	

ENGINEERING SYMBOLS (REF. 1)

SKL MATRIX

SKLTR MATRIX

XKRTOT MATRIX

XLRTOT MATRIX

SKL22 MATRIX

REGTOT MATRIX

STORE MATRIX

XKll PARTITION

XK12 PARTITION

XK22 PARTITION

XK21 PARTITION

$$\begin{bmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{bmatrix}$$

$$\begin{bmatrix} \mathbf{K}_{12} \end{bmatrix}$$

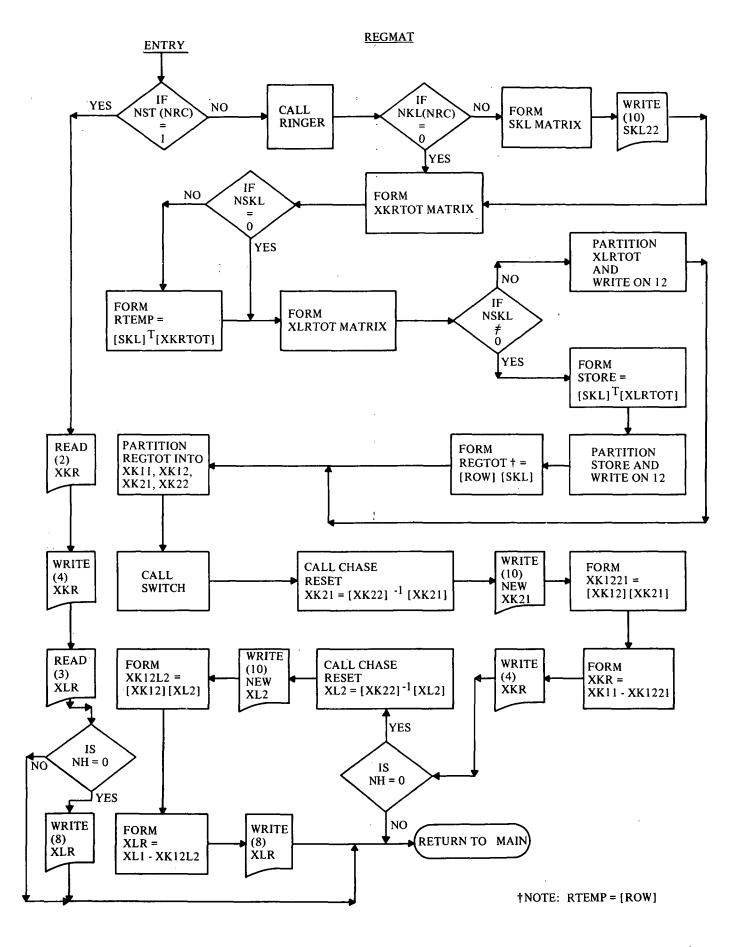
ENGINEERING SYMBOLS (REF. 1)

XL1 P	ART]	ITI	ON
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$$^{\Gamma}$$

$$\begin{bmatrix} \mathbf{K}_{\mathrm{R}} \end{bmatrix}$$

XLR MATRIX,



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                                                                                                         COMMON XN; TEFREE, TIC, PHI, STØP, RESTØP, RTICK, GI, XNL(2), NH
CØMMON NST(30), NKL(30), NXMAT(20), SAVJTC(30), SAVSTP(30), JRTIC(30)
CØMMON JRSTØP(30), NREG, NMPT, NRC, NSC, NIX, IERRØR, KGEØM, IGEØM, ISTTAB
CØMMON KELVIN, IBEGIN, NPRØB, NSEG, NERRØR, Q, THICK, NØJS, NLINKS, NLCASE
                                                                                                                                                                                                    COMMON / ROPIZ/ PRINT
COMMON / ROPIZ/ ROPIZ/ ROPIZ/
DIMENSION XFEMP(8,8), SKL(120,120), SKLTR(120)
DIMENSION XYM(8,8)
DIMENSION XKRTOT(120,120), RTEMP(120), XLRTOT(120,2), XKEEP(8,2)
DIMENSION XKRZC1112, 112), XKR12(8,112), XKR2(112,9)
DIMENSION XKIV(6328), XK1221(8,8), XKR2(8,8)
DIMENSION XKIV(6328), XK1221(8,8), XKR2(8,8)
DIMENSION XKIV(6328), XK1221(8,2), XKR2(8,8)
DIMENSION DEP(112), JIND(15), ANGLE(15)
DIMENSION ROGIOT(4,4), RNGLOD(4,28), JTNO(28)
DIMENSION NG(2014,4), RNGLOD(4,28), JNO(28)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       (LABEL( 1),NI(1)),(LABEL( 3),NZ(1))
(LABEL( 5),N3(1)),(LABEL( 7),N4(1))
(LABEL( 9),NS(1)),(LABEL(11),N6(1))
(LABEL(13),NY(1)),(LABEL(15),N8(1))
(SAEL(13),NKRYØT(1),XKZ2(11),XKYV(11,XKRYØT(1))
(XKR(1),XK1)(1),XTEMP(1),XLR(1),XLR(1))
                                                                    СВММВN STRY(16),XMAT(110,10),STD(10),SADUS(30),RADUS(30)
СВММВN TADUS(30),UADUS(30),SAVTIC(900)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     EQUIVALENCE (SYM(1), XK12L2(1), XK1221(1), HØLD(1), JDEP(1))
                                                                                                                                                                                  COMMON NTSKL, NZ, NBCT, LINPUT, NTRKL, NPASS, XNI, KBC, NRINGS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        EQUIVALENCE (SKLTR(1), REGTØT(1), ØPEN(1), XK12(1))
EQUIVALENCE (STØRE(1), XL2(1), XK21(1))
** ABACUS UPDATED 07/24/72
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            (NH.NE.O.AND.IBEGIN.NE.1) GØ TØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      /BHFBRCE T2
                 SUBRBUTINE REGMAT
INTEGER SAVJTC,SAVSTP,Q,THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     RTEMP(1), ROW(1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           NØJ .= NST(NRC) + NKL(NRC) +1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           (NST(NRC).EQ.1) GØTØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      TOTAL = (NOT-NSKE) *
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 NJTNH4=NH4*NØJ
                                                        INTEGER XN1, XN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           AKION = VINK
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            EQUIVALENCE
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                                681 FORMAT(///51x31HINPUT DATA FOR SEGMENT COUPLING///25x14HREGION NU IMBER ,12,5x25HNUMBER OF SEGMENT JOINTS ,13,5x,26HNUMBER OF KINEMAT 21C LINKS ,13//)
                                                                                 FURMAT(41X,7HSEGMENT,11X,8HJØINT(I),11X,8HJØINT(J)//)
DØ 683 I=1,NSEG
                                                                                                                                                                                                                                                                                                                                                                                                   XKRIØT(II; JJ)=XKRIØT(II, JJ)+XTEMP(I, J)
                                                                                                                                                                                                                                                             READ(2) ((XTEMP(I,J),J=1,8),I=1,8)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ØPEN(1,J) = XTEMP(1+4,J+4)
                       WRITE(6,681) NRC,NØJ,NSKL
                                                                                                                                     WRITE(6,684) I,KTIC,KSTBP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   OPEN(I,J) = XTEMP(I,J+4)
                                                                                                                                              FBRMAT (43X, 2(13, 16X), 13)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           (,C,++1) = XTEMP(1+4,C)
                                                                                                                                                                                                                                                                                                                                                                                                                                                         GØTØ (951,952,953,954)
IX = II
                                                                                                                                                                                                                                                                                                                          IF (J1.CT.J2) GØTØ 950
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           BPEN(I.J) = XTEMP(I.J)
                                                                                                                                                                                                                                     FBRMAT (315, 1644)
                                                                                                            KTIC = SAVJIC(1)
KSTØP= SAVSTP(1)
                                                                                                                                                                                                                                                                                                                                                                                                                          = 4 \pm (32 - 1) + 1
                                                                                                                                                                                               UB 350 I=1,NØJ4
                                                                                                                                                                                                             350 J=1,NØJ4
                                                                                                                                                                                                                        XKRTØT(1,J)=0.0
                                                                                                                                                                                                                                                 UB 701 NS=1, NNI
                                                                                                                                                                                                                                                                        = SAVJTC(NS)
                                                                                                                                                                                                                                                                                    = SAVSTP(NS)
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                                                                                                                                                                                     NNT = NST(NRC)
WRITE(6,1726)
                                                                                                                                                                                                                                                                                                   ·= 4*(Jl-1)
                                                                        WRITE(6,682)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  963 1=1,4
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           1726 FØRMAT(1H1)
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                                                                                                                                                             MFLG = 1
DØ 211 J=1.NRNG
CALL RINGER IQ.XN,RNGTØT,RNGLØD,J,RADUS,TADUS,SAVJTC,SAVSTP,JTNØ,
RBC,XNL,MFLG.NSEG)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          IF (NH.EQ.O) WRITE(6,685)
685 FØRMAT(//60X13HSEGMENT LINKS//43X8HJØINT(J)5X8HJØINT(I)5X20HANGLE
                                                                                                                                                                                                                                                   220 XKRTØT(JT+I,JT+IK) = XKRTØT(JT+I,JT+IK)+RNGTØT(I,IK)
211 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               DØ 103 NRIG = 1,NSKL
IF (Q.EQ.1) GØ TØ 566
READ(5,503) JDEP(NRIG),JIND(NRIG),ANGLE(NRIG)
FØRMAT (212,E14.7,1544)
WRITE(1) JDEP(NRIG),JIND(NRIG),ANGLE(NRIG)
WRITE(6,686) JDEP(NRIG),JIND(NRIG),ANGLE(NRIG)
FØRMAT(45x,13,10x,13,11x,E14.7)
IF(JIND(NRIG),GE.JDEP(NRIG)) GØ TØ 8797
                                                                                                                                                                                                                                                                                                                                                                                                                                       WRITE(12) ((XKRIØT(I,J),J=1,NØJ4),I=1,NØJ4)
                         DØ 957 J=1,4
XKRIØI(IX,JX) = XKRIØI(IX,JX) + ØPEN(I,J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 566 READ(1) JDEP(NRIG), JIND(NRIG), ANGLE(NRIG) 103 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                       IF(NSKL.NE.O) G0 TØ 931
DØ 5504 I=1,NØJ4
ERITE(2) (XKRTØT(I,J),J=1,NØJ4)
                                                                                                      NRNG = NRING(NRC)
IF (NRING(NRC).EQ.0) GØ TØ 210
IF (Q.EQ.5) WRITE(6,300)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IF(IJ.EQ.JDEP(N)) GBTB 11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   IF (0.EQ.5) READ(5,2000)
                                                                                                                                                                                                                                                                                      IF (Q.NE.5) GØ TØ 210
WRITE(6,300)
READ(5,2000)
                                                                                                                                                                                                                     JT = 4*(JTNØ(J)-1)
DØ 220 I=1,4
DØ 220 IK=1,4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          L&N.1 = LI 001 &0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   00 501 J=1,NJTNH4
00 501 I=1,NJTNH4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      16F BRIENTATION//)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              SKL(I, J)=0.0
00 956 I=1,4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            JD = JDEP(N)
                                                                                                                                                   FØRMAT(///)
                                                     957 JX = JX + 1
956 IX = IX + 1
                                                                                                                                                                                                                                                                                                                                                                                                                GØ TØ 101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  2000 FORMAT(1X)
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                                                                                960 CONTINUE
701 CONTINUE
              ONI = XC
                                                                                                                                                                                                                                                                                                                               CONTINUE
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	ZI 7 #	3106
	= CØS(A	106
	-L1-NRIG) N=N+1	2106
	I. J) = RADUS(JD)/RADUS(JI)	2106
	#	2106
	SKL(I+2,J+3) =-SKL(I+1,J+3)*C@TAN	2106
		106
12	SKE(1, J) = 1	106
13		106
	1+2, 1+2) = 1	106
	SKL(1+3, J+3) = 1.0	901
100		106.
5000		901
	-	901
		06
	DØ 768 1=5,1I	9016
768	XX I	901
)206
702	WRITE(2) (SKL(1,J),1=1	902(
	((SKL(I,1),J=1	902(
		9020
	READ(12) ((XKRT@T([,J),J=1,N@J4),I=1,N@J4)	9020
		9020
1000	CONTINUE	902
	-I.NJINK4	905
	READ(2) (SKLTR(J),J=1,N0J4)	
	=	902
	3	902
i	DØ 741 K=1,NØJ4	902
741	RIEMP (J)=RIEMP (J)	206
,		206
40	CENTINO	200
3	THE TOTAL TO CO TO	206
101	DENINO 2	.206
	NEW 110 2 NO 12 NO	206
	7 36	206
757	XI RTRICI	902
1	00 971	905
	SAVJT(902
	VAS =	305
	5	305
	971 N =1,2	.206
	GØTØ (981,	206
981		706
	(11 = 11 + 5 Cata one	206
082	11 = 11	306
	111=111 + 3	905
983	16 90	206
	0= 1	305
	(N.EQ.2) I	905
		200
120	I = I + I	706
	1F (NRNG, FD, O) GO TO 230	·206·
	08 225 J=1,NRNG	706
	1-(1)8N1(1)++ = 1	706
	526	706
ٺ	-	206
		.704

		05.45.00
	X_RTBT(J1+1,1K) = X_LKIBI(J1+1,1K)+KNGLBU(I+J)	902430
922	C C C C C C C C C C C C C C C C C C C	902431
222	CONTINUE	902480
1.	RETIND 3	902490
	IF (NSKL.NE.O) GBTB 147	902500
-	411,4	902510
1119	WRITE(3) (XLRIBI(1, J), J=1, NPRBB)	902520
	=NJINK 4-3	902530
	=M3,NJINK4	902540
118	- ,	902550
	7. 4. 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	9025709
117	OF LIT (1-7) THE PROPERTY OF	902580
11	I VEN I DI LI I I I I	902590
	COTA 100	902600
147		902610
	AD(2) (SK	902620
	J=1,NPR.08	902630
	RE(1,J)	902640
	K=1,NØJ4	902650
748	STØRE(1, J)=STØRE(1, J)+SKLTR(K)#XLKIØ1(K, J)	902660
3	CBNIINUE Da oilo 141.4	902680
910	17F(3)	902690
:	- 3	902700
	A DE	902710
918	17F(3)	902720
	4-4	902730
	. %	902740
917	(TE(3)	902750
	REMIND 3	092206
1001		902770
	L'EQ.0) GØ TØ 102	902.780
	READ(2) ((SKL(I,)),J=I,NJINK4),I=I,NBJ4)	009600
	KEMINU Z DO 750 Lalanianinka	902820
	D(12) (RBW(J)	902830
	-I-I .NJINK4	902840
	STØT (J	902850
1	K=1,NØJ4	0028206
751	KRGIOI (C) KKGIOI (C) + KOMINITANI	902880
ני	THE 780 LOOP REARRANGES	902890
102	NJINK4/4	902900
	2 (902910
	625	026206
424	156 626 JAK#196	902940
	CØ 625 KIX=1.M8	902950
	12 (INK, KIX)=0	902960
•	XK21(KIX, INK)=0.0	00 5000
625	~	902990
	02 627 LAX=1.m8	903000
627	22 (KIX, LAX)	903010
	NREAD=0	903020
	KBUNT=-8	903040
	XVIIVALENCE SC	903050
	EAD=A	090606

	KØUNT+4 I=1,4	
181	READ(2) (HØLD(1,J),J=1,NJINK4) IF(NREAD.LE.2.0R.NREAD.GE.NJINK3)GØ TØ 790	
- - ·	- KBON X	
- ;	DØ 785 L=KK,KKK [RØW=4*(NREAD-2)	
, _	J=L-4 00 785 K=1,4	
	IROW=IROW+1	
. 785	XX22(IRBW,J)=HØLD(K,L) GØ TØ Z80	
790	(NREAD. EQ. 11GB TB 79	
	TØ 792	
	IF(NREAD.EQ.NJINK)GW TW 794	
791	796 I=1,4	
	00 796 J=1,4 xx11(1,1)=Hallo(1,1)	
. ,	1	
196	12(11,)	
70.2	G0 T0 780	
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_	<u>.</u>	
	JJ=J+4 ×× 22([. 1]=Hall D([. 1])	
	- 89	
	IF(NNT.EQ.2) GB TB 795	
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795		
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793	CB 18 180 MII=NJINK4-11	
	M4=NJINK4-4	
	¥Z S	
~ ~	7. SEE 11. 4. C. S. C. S	
_	BW=KR	
	XC0L 4	
_	0.0 798 J=M11, M8	
•	XX 22 (KKOW,KB)=H0LU(1,J) = +4	
	7+02+1 7+82+1	
	XXZ2(KRØW,KK) =HØLU(I,JJ)	
-	100110+8 1001111111111111111111111111111	
798	XX21(KR0W,KC0L)=H0LD(I,JJJ)	-
	GØ TØ 780	
1961	KEND=NJINK4-8 KRGW=4	
	H-NJINK44	
	M7=NJINK4-7	
· ·	ON=KR0	
-	K4=KEND-4	
-	KC0L=4	

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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              WARNING - NEGATI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         5011 F@RMAT[///55X23HREGI@N STIFFNESS MATRIX//14X8HDELTA T17X8HDELTA Z
11,7X,8HDELTA R1,7X,7HTHETA 1,8X,8HDELTA T2,7X,8HDELTA 22,7X,8HDELT
                                                                                                                                                                                                                                                                                                                         j
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   WRITE(6,688) (LABEL(1),1=II,III),(XKR(M,J),J=1,8)
FURMAT(/1X,2A4,1X,8(E14,7,1X))
CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             WRITE (10) ((XK21(1,J),J=1,B),I=1,M8 )
WRITE (10)(( SAVJIC(1), SAVSTP(1)),I=1,NNT)
                                                                                                                                                                                                                                                                                                                  XK1221(1, J) = XK1221(1, J) + XK12(1, K) * XK21(K, J)
                                                                                                                                                                                                                                                                                                                                                                                                                                      WRITE (4) ((XKR(I,J),J=1,8),I=1,8)
IF (NH.NE.O.AND.IBEGIN.NE.1) GØ IØ 691
                                                                                                                                                                                                CALL SWITCH (XKIV,-NKIV)
CALL CHASE (XKIV,NKIV,XK21,8,112,NIX)
IF (NIX,LI,0) G010 8841
                                                                                                                                                           XK22(1,K)=(XK22(1,K)+ XK22(K,1))/2.
                                                                                                                                                                                                                                                                                                                                                                                                            xkR(1,J) = (xkR(1,J)+xkR(J,1))/2.0
650 xkR(J,1) = xkR(1,J)
                                                                                                                                                                                                                                                                                                                                  DØ 82 J=1,8
DØ 82 I=1,8
XKR(I,J)=XKII(I,J)-XKI221(I,J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                IF(XKR(1,J).GE.0.0)GØ TØ 138
                                                                799 XKII(KRØM,KCØL)=HØLD(I,JJ)
780 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          IF(INDEC.EQ.0)G0 T0 151
                        XK12(KRØW,K4)=HØLD(I,J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IF (NH.NE.O) GØ TØ 151
                                                                                       NSING=NKIV*(NKIV+1)/2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      IF(J.NE.1)GØ TØ 138
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       2A R2,7X,7HTHETA 2)
                                                                                                                                                                       XK IV( IK) = XK22( I, K)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SYM([', J) = XKR([, J)
                                                                                                                                                                                                                                                                                          XK1221(I,J)=0.0
00 81 K=1;NKIV
 DØ 799 J=M7, M4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                 WRITE(6,5011)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                UE 687 M=1,8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          00 137 J=1,8
00 137 I=1,8
                                                                                                                                                                                                                                                                                                                                                                        08 650 J=1,7
                                                                                                                                                                                                                                                                                                                                                                                                  0.0 650 I=K,8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SYM(I, J) =0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            00 138 1=1,8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           38 J=1,8
                                       KCBL=KCBL+1
                                                                                                                                 DØ 10 K=1,N
DØ 10 I=K,N
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             11=111+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           1+11=111
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                INDEC=0
                                                                                                                                                                                                                                                                                                                                                                                     1+1 +
                K4=K4+1
                                                                                                                                                                                      [K=[K+]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 INDEC=1
                                                                                                      N=NK IV
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     0=111
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   688
687
691
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               152
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                                                                                                                                                                                                                                                                                                                                                            82
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                                                                                                                                                                                                                                                                                                                     .81
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904900 904910 904920 904930 904940 904940 904960 904980 904980 905010 905010 K = J-1 DØ 651 I=K,8 XKR(1,J) = (XKR(1,J)+XKR(J,I))/2.0 SI XKR(J,I) = XKR(I,J) WRITE(4) ((XKR(I,J),J=1,8),I=1,8) IF (NPRØB.EQ.0) GØ IØ 150 READ(3) ((XLR(I,J),J=1,NPRØB),I=1,8) WRITE(8) ((XLR(I,J),J=1,NPRØB),I=1,8) GØTØ 150 1 READ (2) ((XKR(I,J),J=1,8),I=1,8) DØ 651 J=1,7 8842 IERRØR=8842 NERRØR=31

150

651

1100270

100290

100260

1100350

100330

1100380

1100400

1100020 1100030 1100040

1100050

1100060 1100070 1100080

100100

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1200090
1200100
1200110
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1200150
1200150
1200170
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1200250
1200260
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                   1200000
                              200010
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                                                                                                                                                                                                                                                                                            1200220
                                                                                                                                                                                                                                                                                                       1200230
                                                                                                                                                                                                                                                                              IF (PRINT .GT. 0.) WRITE (6,10) K, (Y(K1), K1 = MK1,11)

11 = 11 + HID
SUBREUTINE ##DII ## ABACUS UPDATED (07/07/72 ..... SUBREUTINE CHASE(A,MO,Y,NO,MID,NIX)
REAL A(1),Y(1)
                                                    COMMON /WINTER/ INDICA
COMMON /BGND/ M.L
COMMON /OPT2/ PRINT
9 FORMAT(12H1SØLUTIØN(S)/IHO)
10 FORMAT(15,1P8E15.7/(5X,8E15.7))
                                                                                                                                                                                                         IF (PRINT .GT. 0.0) WRITE(6,9)
                                                                                                                                                                               F (NIX) 170,110,110
                                                                                                                                                         IF (NO) 110,100,100
CALL FUTILE(A,M,NIX)
                                                                                                                                                                                                                                                                                                           MKI. = MKI + MID
                                                                                                                                INDIC8=0
N = IABS(NO)
                                                                                                                                                                                                                                                                                                                     160 CØNTINUE
170 RETURN
                                                                                                                       211
                                                                                                                                                                    100
                                                                                                                                                                                               110
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C .... RQUTINE **D12 ** ABACUS UPDATED 07/19/72 .....
SURRQUTINE FUTILE(A,N,NIX)
DQUULE PRECISION SUM
EQUIVALENCE (SUN,SUM)
K1 = 1
KK = 0
UD 2.10 K = 1,N
KK = KK + K
KK = KK + K
KK = KK - I
KK = KK - I
K = KK
KK = KK - I
K = KK
KK = KK - I
K = KK
KK = KK + I
K = KK
KK = KK - I
UD 10 TØ LEAP
CO ASSIGN BO TØ LEAP
CO TØ LEAP, (B0,100)
BO 10 = K,N
CO TØ LO = SUM
CO TØ LO = SUM
CO TØ LO = SUM
CO TØ LO
CO TØ TØ TØ TØ TØ
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mala est

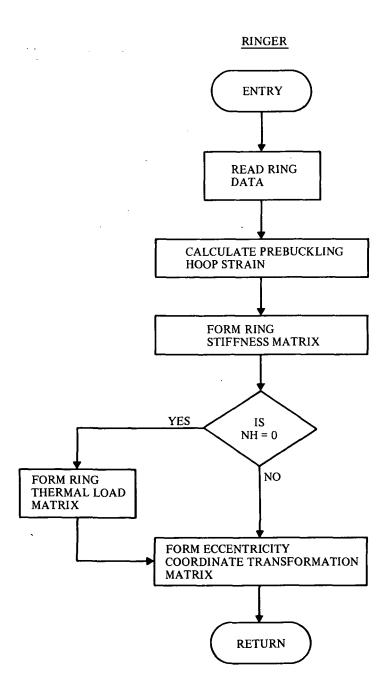
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1400040
1400050
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                                                                                         1400110
1400120
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1400140
1400150
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1400220
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1400280
1400290
1400310
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1400330
1400340
1400360
1400360
                         400030
** ABACUS UPDATED 07/19/72 ....
                REAL A(1),Y(1)
COMMON /WINTER/INDICS
COMMON /BOND/ M,L.
EQUIVALENCE (SUN,SUM)
         SUBRBUTINE TRIEGIA, Y)
  C .... RØUTINE #*D13
                                                                                                                                    1+1) \- = WNS
                                                                                                                                            11 = [1
                                                                                                                                                                                                                                                                                                    170 RETURN
                                                                                                                                                                                  120 Y(f+1
125 IF (f)
130 II =
140 I = M
                                                                                                                                                                   110 11
                                                                                  1001
                                                                                                                                                                                                                                                                                    160
                                                                                                                    105
                                                                                                                                                                                                                                                    150
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SUBROUTINE RINGER

This subroutine reads the discrete ring geometric data, and temperatures, and forms the ring stiffness and thermal load matrices. These matrices are passed back to either of subroutines REGMAT or STRMAT (see next) as necessary, for incorporation into the region or structure matrices, respectively. If the present pass is a nonlinear one, the effects of prebuckling hoop strain are considered, and the load calculations are omitted.

The calculations in RINGER account for the eccentricity of the ring centroid from the base shell wall, and the offset of the ring centroid from the shear center.

FORTRAN CODE	ENGINEERING SYMOBIS (REF. 1)
RNGTOT MATRIX	$\left[\mathbf{k}_{\mathrm{R}} \right]$
TDEL MATRIX	
RNGLOD MATRIX	
RC	$\mathbf{r}_{\mathbf{c}}$
RS .	r s
xc	x _c
YC	x _s



3300000.	3300030 3300040 3300050 3300060 3300070	3300090 3300100 3300110 3300120 3300130	3300150 3300160 3300170 3300180 3300190 3300200	30023 30023 30024 30025	3300270 3300280 3300290 3300300	3300340	3300380	3300420 3300430 3300440 3300450 3300460 3300470	3300490 3300500 3300510 3300520	3300550 3300560 3300570 3300580
C RØUTINE ** RINGER ** ABACUS UPDATED 06/18/72 SUBRØUTINE RINGER (0,XN,RNGTØT,RNGLØD,J,ADUS,BADUS,JTIC,JSTØP,	INTEGER Q,XN [NTEGER Q,XN CAMMON /ARING/ NRING(28),AMAT(30,4),IRLC(28) UIMENSION RNGTOT(4,4),RNGLOD(4,28),TDEL(4,4),XKTOT(4,4),XL(4) DIMENSION ADUS(30),BADUS(30),JTLC(30),JSTOP(30),JTNO(28),XNL(2) X1 = XNL(1) X2 = XNL(12)	0.1) GB TB 212 213) JINB(J),EA,EIY,EIXY XB,TI;TD,TF;IRLC(J) 12,5E14,T/6E12.5/5E14.7; II-TB/(KI-XB) TB-TF;*XI-(TI-TF)*XB)/(X	ITE(1) JTNB(J),EA,EIY,EIXY,GJ,EI AMN,BN,IRLC(J), RØJ,ENT ITE(6,300) JTNB(J),EA,EIY,EIXY,G XI,XB,TI,TD,TF, RØJ KHAT(/55X,-RING AT JØINT NØ,I PEIZ,5,5X,-EIXY -+,IPEIZ,S,4X,-G	IPE12.5,6X,-XBAR =-,1PE12.5,4X,-YBAR =-,1PE12.5,4X,-XI = IPE12.5,5/-X0 =-,1PE12.5,6X,-TI =-,1PE12.5,6X,-T0 =-,1PE12.5,4X,-TEEE =-,1PE12.5,3X,	GØ TØ 211 212 KEADII) JINB(J),EA,EIY,EIXY,GJ,EIX,ALPR,RC,XC,YC,XBAR,YBAR, 1 AMN,BN,IRLC(J), RØJ,ENTHJ,ENTHK 211 CØNTINUE 1F (KBC,EQ.O) GØ TØ 100	EPSILI=ENTHJ/EA	EPSIL2=AMAI(K,2) GO TO 101 102 EPSIL2=AMAI(K,4) EPSIL2=AMAI(K,4) 101 CONTINUE	•		T(1,

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300640
                                                                                                                                                   300710
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                                                                                                                                                                                                                                                                                                                                                               300880
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= 1.0/RCS*(EA*YC*AM2*(XC*AM2/RS2-1.0/RS)+EIY*YC*AM2/
                                                                                                                                                -EA#YC#AM2#AM/(RS2#RS)
AM2/(RS2#RC)#(YC2#(EA+EIY/RC2)+EIX+2"O#EIXY#YC/RC
                                                                                                      AM4/RCS3#(EA#YC2+EIY#YC2/RC2+EIX+2.0#EIXY#YC/RC)+
                                                                                                                                                                                                                                                                                                                   I.O/RCS#(YC2# EA+EIY#YC/RC+EIX+2.0#EIXY#YC/RC)+
            [RC2*RS)*(AM2-1.0)+EIXY*AM2/RCS*(AM2-1.0))
                                                                                                                                                                                                                                                                                                                                               .0/RCS#EPSIL#(EA#(-YC2)+(EIY+EIX)#AM2-EIX)
                                             ='1.0/RCS*(EA*YC*(XC*AM2/RS-1.0)+EIY*YC/RC2*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 = RNGTØT(L,M)+TDEL(N,L)*XKTØT(N,M)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       = XKTØT(L,M)+RNGTØT(L,N)*TDEL(N,M)
                                                                         -EAPS*AM2*YC/RS2+EAPS*YC/RS2
                                                           AM2-1.01+EIXY/RC# (AM2-1.0)
                               - EA#AM/RS2# (-XC#AM2/RS+1.0)
                                                                                                                                                                                                                                                                                                                                                                                                                      RNGLØD(3,1) = 0.0
RNGLØD(4,1) = -TEM1*VC-EIXY*ALPR*AMN/RS
                                                                                                                                                                                                                                           EA#AM2#RC/(RS2#RS)
                                                                                                                                                                                             AM2/KCS#(EAPS#XC)
                                                                                                                    3J#AM2/(RS2#RS2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            -AM*YBAR/(RS*XBRS)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -AM*XBAR/(RS*XBRS
                                                                                                                                                                                                                                                                                                                                                                             AMN#XC+BN)/RS
                                                                                                                                     FAM2/RCS*EAPS
                                                                                                                                                                                                                                                       -EA#YC#AM/RS2
                                                                                       = RNGTØT(2,1)
                                                                                                                                                                                                             RNGTØT(3,1)
                                                                                                                                                                                                                             RNGTØT(3,2)
                                                                                                                                                                                                                                                                        RNGTØT(4,1)
                                                                                                                                                                                 ·GJ*RC/RS)
                                                                                                                                                                                                                                                                                                                                   GJ*AM2/RS2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -1.0/XBRS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XBRS = 1.0-XBAR/RS
                                                                                                                                                                                                                                                                                                                                                                                           RNGLØD(1,J) = TEM
                                                                                                                                                                                                                                                                                                                                                             IF (0.Eq.1) GØ 1
                                                                                                                                                                                                                                                                                                                                                                             EMI = EA#ALPR#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DØ 813 N=1,4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             00 813 L=1,4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DB 814 L=1,4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            00 813 M=1,4
RNGTØT(2,1)
                          RNGTØT(3,1)
                                           RNGTØT (4,1)
                                                                                      RNGTØT(1,2)
                                                                                                                                                 RNGTØT (3,2)
                                                                                                                                                              RNGTET (4', 2)
                                                                                                                                                                                                                                                                                                                    RNGTØT (4,4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    RNGTØT(L,M)
                                                                                                      RNGTØT(2,2)
                                                                                                                                                                                                                                                                                                     RNGTØT (3,4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XKTØT(L,M)
                                                                                                                                                                                                                                                                                                                                                                                                         RNGLØD(2,J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XKTØT(L,M)
                                                                                                                                                                                                            RNGTØT(1,3)
                                                                                                                                                                                                                                                                       RNGTØT(1,44
                                                                                                                                                                                                                                                                                     RNGTØT (2,4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               RNGTØT (L, M)
                                                                                                                                                                                                                           KNGTØT (2,3
                                                                                                                                                                                                                                           RNGTØT (3,3
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      I DEL (3,3)
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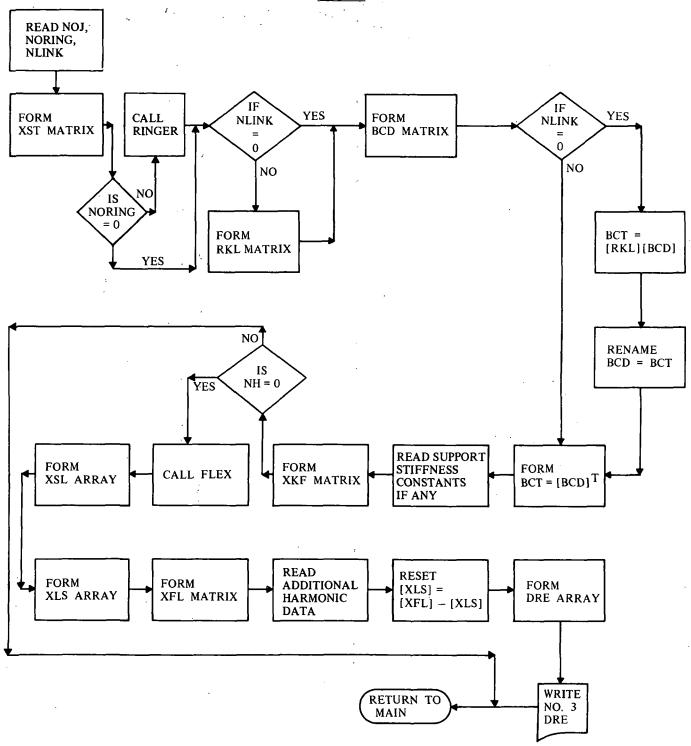
00 815 N=1,4
815 XL(L) = XL(L)+TDEL(N,L)*RNGL@D(N,J)
DB 816 L=1,4
816 & 816 L=1,4
816 & 816 L=1,4
816 & 8170 L=1,NSEG
IF (JTN@[J).EQ.JTIC(L)) GB T@ 1105
I100 & 8170 L=1,NSEG
I101 & 8170 L=1,4
820 NTINUE
I108 M = JST&PPL
BB 820 M=1,4
820 RNGL@D(L,J) = RNGL@D(L,J)*RMULT
I GB 820 M=1,4
820 RNGL@D(L,J) = RNGL@D(L,J)*RMULT
II BB 820 L=1,4
821 RNGL@D(L,J) = RNGL@D(L,J)*RMULT
II BB 821 L=1,4
822 RNGL@D(L,J) = RNGL@D(L,J)*RMULT

SUBROUTINE STRMAT

The region stiffness matrices, XKR, and the region load matrices, XLR, are passed from REGMAT to STRMAT via Tape #4 and Tape #8, and are placed in the XKSTOT array and the XLSTOT array, respectively. A matrix, BCD, is formed to represent the boundary conditions, and, if kinematic links occur between regions, the RKL matrix is developed to represent this situation. The subroutine RINGER is again called for discrete ring matrices. In passes other than the first pass, first cycle, the load calculations are not performed.

As a result of appropriate matrix operations, a reduced structure stiffness matrix is formed. In passes other than the first pass, first cycle, STRMAT terminates here. In the first pass, first cycle, the following calculations are made. Subroutine FLEX, a routine identical to SREVN2 (except for being in single precision) with the name changed due to the structure of the OVERLAY option, is called to invert the structure stiffness matrix thus producing A, the flexibility matrix for the structure. The region end deflection array, DRE, is produced as the result of another set of matrix operations.

FORTRAN CODE	ENGINEERING SYMBOLS (REF. 1)
BCD MATRIX	[BC]
BCT MATRIX	[BC] ^T
XST MATRIX	$\left[\kappa\right]_{\mathrm{T}}$
XKF MATRIX	[K] _F
A MATRIX	[A] _F
XSL MATRIX	
XLS ARRAY	\(\bigc_{\tau}\)_F
XFL ARRAY	{F} _F
DRE ARRAY	$\left\{\Delta ight\}_{\mathrm{T}}$



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                                                 EQUIVALENCE (XKR(1), XLR(1), BC(1), BCT(1), BCA(1), TEMP1(1), LBC(1))
                                                                                                                                                                                                                                                GOUIVALENCE (XST(1), BCD(1), A(1), XSTBC(1), RKL(1), XLS(1))
GOUIVALENCE (XSTR(1), XKF(1), XFL(1), XSL(1), DRE(1), SCLA(1),
TEMP(1), BPEN(1))
/ ** ABACUS UPDATED 07/19/72 ....
                                  INTEGER XN1,XN
DØUBLE PRECISION SAVIIC,TIC,PHI,STØP,RESTØP,RTICK
                                                                                                                                                                                                                                                                                                                                                                                  1 FØRMAT(1H ,8(E14.7,2X)/(3X,8(E14.7,2X)))
101 FØRMAT (315,1644)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      READ(4) ((XKR(I,J),J=1,8),I=1,8)
                       INTEGER SAVJTC, SAVSTP, Q. THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                          READ(5,101) NOJ, NORING, NLINK
                                                                                                                                                                                                                                       DIMENSION COLTTL(2)
        SUBBOUTINE STRMAT
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C. ... ROUTINE **DI4
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                                                                                                                                                                                                                                                                                                                                                                                                                                         IF (NØRING.EQ.O) GØ TØ 1170
MFLG = 2
DØ 1211 J=1,NØRING
CALL RINGER (Q,XN,RNGTØT,RNGLØD,J,SADUS,UADUS,JRTIC,JRSTØP,JTNØ,
KBC,XNL,MFLG,NREG)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IF (NH.NE.O) GØ TØ 3108
C GENERATIØN ØF BC BØUNDARY CØNDITIØN SCRAMBLING MATRIX
WRITE(6,347) NØJ,NLINK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1220 XST(JT+1,JT+IK) = XST(JT+I,JT+IK)+RNGTØT(I,IK)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     00 107 I=1,NJTNH4
107 WRITE (2) (XST(I,J),J=1,NJTNH4)
REWIND 2
                                                                                                                                                                                                                                                                                                                                                                          XST(IX, JX) = XST(IX, JX) + ØPEN(I, J)
          DØ 460 JK=1,4
GØ TØ (451,452,453,454),JK
                                                                                                                                                                                                                                                                                                                           ØPEN(I,J)=XKR(I+4,J+4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          IF (0.NE.5) GØ TØ 1170
                                                                                                                                                                    462 @PEN(I, J)=XKR(I, J+4)
                                                                                                                                                                                                                     DØ 463 1=1,4
UØ 463 J=1,4
ØPEN(I,J)=XKR(I+4,J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         JT = 4*(JTNB(J)-1)

DØ 1220 I=1,4

DØ 1220 IK=1,4
                                                                                       OPEN(I, J)=XKR(I, J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     00 348 I=1,NREG
                                                             00 461 1=1,4
                                                                                                                                          00 462 [=1,4
                                                                                                                                                  DØ 462 J=1,4
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                                                                                                    GB TB 455
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100 CONTINUE
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11=11+1
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                                                                                                                                                                                                                                                                                                                                                                                         457 JX=JX+1
456 IX=IX+1
                                                11=0N1
                                                                                                                                                                                                                                                                                     CC = QN I
                                                                                                                                                                                                                                                                                                                                                      2X=X2
                                     ] [ = X ]
                                                                                                                 1 X = 1 1
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                                                                                                                                                                                            453 IX=JJ
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1HDELTA Z,5X,7HDELTA R,5X,7H THETA ,7X,11HANGLE ALPHA)
00 109 J=1,NØJ
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                                                                                                                                                                                                                                                        1824 FØRMAT(//60x,12HREGIØN LINKS//43x,8HJØINT(J),5X,8HJØINT(I),
15x;20HANGLE ØF ØRIENTATIØN)
DØ 502 NRIG=1,NLINK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    WRITE(6,2373) JN,11,12,13,14,ANGLE
FWRMAT(/31x,13,9x,12,10x,12,10x,12,10x,12,7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        READ (5,110) JN, DLP(1), DLP(2), DLP(3), DLP(4), ANGLE 110 FORMAT (12,4F2.0,E14.1)
                                                                                                                                                                                                                                                                                                                                MRITE(6,1828) JD, JI, COTAN

1828 FØRMAT(46X,12,11X,12,11X,E14.7)

COTAN = COS(COTAN)/SIN(COTAN)

CPEN(1,1) = SADUS(JD) / SADUS(JI)

0PEN(2,4) = - (SADUS(JD)-SADUS(JI))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            WRITE(15) (RKL(1,J),J≈1,NJTNH4)
REWIND 15
                                                                                                                                                                                                                                                                                                                                                                                                            GPEN(3,4) = - @PEN(2,4)* COTAN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IF (LINPUT.EQ.0) G0 T0 3200 00 100 100 J=1,NJTNH4 U0 100 100 I=1,NJTNH4
           WRITE(6,349) I,KTIC,KST0P
FØRMAT(46X,12,2(16X,13))
                                                          [F(NLINK.EQ.0) GØ TØ 3108
                                                                                                                                                                                                                                                                                                       READ(5,503) JD, JI, COTAN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      RKL(IXX, JXX)=8PEN(I, J)
                                                                                                                   00 757 [ = 1,NJTNH4 RKL[1,1] = 1.0
                                                                        DØ 756 I=1,NJTNH4
DØ 756 J=1,NJTNH4
                                                                                                                                                                                                                                                                                                                    FBRMAT(212, E14.7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               00 781 I=1,NJTNH4
KST@P=JRST@P(1)
                                                                                                                                                                                                               0PFN(3,3) = 1.0
                                                                                                                                                                                                                            GPEN(4,4) = 1.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   E-(NC#7) =
                                                                                                                                                                 00 789 J=1,4
                                                                                                                                                                                                                                             #RITE(6, 1824)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   WRITE(6,2372)
                                                                                                                                                                                 0PEN(1,1)=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                           DØ 504 I=1,4
                                                                                                      756 RKL(II, J) = 0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  108 RCD(I, J) =0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DB 505 J=1,4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   READ(5,2000)
                                                                                                                                                  DØ 789 I=1,4
                                                                                                                                                                                               CPEN(2,2) =
                                                                                                                                                                                                                                                                                                                                                                                                                             1XX=' J0#4-3
                                                                                                                                                                                                                                                                                                                                                                                                                                                         JXX= J[#4-3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         12 = 0LP(2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       13 = DLP(3)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          11 = 0 LP(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    505 JXX=JXX+1.
504 IXX=IXX+1
502 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               HTRKL = 15
                                             CONTINUE
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                             349 (
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                                                                                                                                                                                                                                                                                                                                REWIND 4

DØ 126 M=1,NJTNH4

READ(4) (BCD(M,N),N=1,NZ)

AT THIS PØINT THE BCD ARRAY IS THE PRØDUCT ØF RKL AND BCD ARRAYS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            WRITE(14) ((8CD(I,J),J=1,NZ),I=1,NJTNH4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      GØ TØ 3201
READ(14) ((BCD(1,J),J=1,NZ),[=1,NJTNH4)
CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       DØ 181 N=1,NJTNH4
TEMP1(M) = TEMP1(M)+SSTR(N)+BCD(N,M)
                                                                                                                                                                                                                                                                                                                                                                                               NBCT = 3

DØ 124 J=1,NZ

WRITE (3) (BCD(1,J),I=1,NJTNH4)

DØ 125-I=1,NJTNH4

WRITE (3) (BCD(I,J),J=1,NZ)
                                                                                                                                                                                              NZ=ICR

IF(NLINK.Eq.0) GØ TØ 3124

DØ 783 N=1,NJTNH4

READ(NTRL) (TEMP(M),M=1,NJTNH4)

BCT(J)=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     WRITE(14) (BCD(1,J),1=1,NJTNH4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DØ 183 II=1,NJTNH4
READ (4) (XSTBC(II,JJ),JJ=1,NZ)
REMIND 4
DØ 182 N=1,NZ
DØ 185 M=1,NZ
                                                                                                                                                                                                                                                                            DØ 782 I=1,NJTNH4
BCT(J)=BCT(J)+TEMP(I)*BCD(I,J)
WRITE (4) (BCT(L),L=1, NZ)
REMIND NTRKL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DØ 180 L=1,NJTNH4
READ (2) (XSTR(J),J=1,NJTNH4)
DØ 184 M=1,NZ
BCD(II+1, ICR) = -CØS(ANGLE)
GØTØ 118
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            → WRITE(4) (TEMP1(I),I=1,NZ)
180 CØNTINUE
                                                                                           BCD(II-1, ICR)=CØS(ANGLE)
                                                    116 BCD(II, ICR)=SIN(ANGLE)
                                                                                                       BCD(II, ICR) = SIN(ANGLE)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DØ 3300 J=1,NZ
                                                                                                                                                                       READ(5,2000)
ICR=ICR-1
                                                                                                                   118 ICR=ICR+1
                                                                                                                                 113 11=11+1
121 CØNTINUE
109 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         184 CONTINUE
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                                                                                                           IF (NLCASE.EQ.1.aND.xN.EQ.0.0) GØ TØ 182
IF ((XN.EQ.XN1.aND.NPASS.EQ.2).0R.(NH.NE.O.aND.NPASS.EQ.1))
WRITE(11) (XKF(1),[=1,N2)
                                       WRITE (4) (XKF(I),I=1,NZ)

JF (NLCASE,NE,1_0R,XN1,NE,0.0,0R,NH,NE,0) GØ TØ 188

WRITE(11) (XKF(I),I=1,NZ)
                                                                                                                                                                                                                                                                               FORMAT(50x, 29H THE REDUCED STIFFNESS MATRIX/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                NUMBER = NUMBER + 3
WRITE(6,1729) ((COLTTL,ICOL(M)), M=1, MM)
FORMAT(/10H ROW ,8(244,1%,13,3%)/)
DØ 1722 [=1,NZ
NUMBER + 1
WRITE(6,1728)!,(A(I,J),J=JJ,JJJ)
FORMAT(3%,13,4%,8(E14,7,1X))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        WKITE(6,1729) ((COLTTL, ICOL(M)), M=1, MM)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DB 805 N=1,NZ
TEMP(M) = TEMP(M) + BC(N)*A(N,M)
         186 XKF(M)=XKF(M)+BCT(K)*XSTBC(K,M)
185 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            IF (NH.NE.O.BR.KBC.NE.O) GØ TØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     CALL FLEX (A,NZ,SCLA,124,NIX)
1F (NIX.NE.O) G0 T0 8777
D0 804 L=1,NJTNH4
READ(3) (BC(1),1=1,NZ)
                                                                                                                                                                                                                                                                                                                                                                                (1F (111.61.NZ) MM=8-(111-NZ)
                                                                                                                                                                                                           DØ 187 I=1,NZ
READ(4) (A(I,J),J=1,NZ)
IF (IBEGIN.EQ.0) GØ TØ 2750
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  IF (NUMBER.LT.55) GØ TØ 1722
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                WRITE (2) (TEMP(1), I=1,NZ)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               IFIJJJ.NE.NZ) GØ TØ 1725
1750 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                         IF(JJJ.GT.NZ) JJJ=NZ
DØ 1721 M=1,MM
ICOL(M)=MMM
 K=1,NJTNH4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             WRITE(6,1726)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            TEMP(M) = 0.0
                                                                                                                                                                                                                                                                                                                                                       111 = 111 + 8
                                                                                                                                                                                                                                                                                                                                                                                                                                                      MAM II MAM + II
                                                                                                                                                                                                                                                        WRITE(6,1726)
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                                                                                                                                                                                                                                                                     WRITE(6,2365)
                                                                                                                                                                                                                                                                                                                                          11 + 111 - 11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             00C = 0.0
RØR = 0.0
                                                                                                                                                                     NBCT = 14
REWIND 2
REWIND 4
                                                                                                                                                                                                                                                                                                NUMBER = 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               NUMBER = 3
                                                                                    GØ TØ 182
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CONTINUE
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12OHPØINT ØF APPLICATIØN,7X,12HAPPLIED LØAD//)
DØ 304 N=1,LINLØD
READ(5,305) JEXT2,JEXT1,XFL(JEXT1,JEXT2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 FØRMAT(215,E14.7)
hrite(6,342) jext2,jext1,xfl(jext1,jext2)
førmat(41x,13,22x,13,15x,E14.7)
                                                                                                                                                                                                                                                                                                                                                                                         IF (IK.EQ.1.AND.IRLC(J).EQ.2) GØ TØ 1226
                                                                                                                                                                                                                                                                                                                                                                                                     XSL(JT+I,IK) = XSL(JT+I,IK)+RNGLØD(I,J)
                                                                                               J2 = JRSTØP(NR)
READ(8) ((XLR(I,J),J=1,NPRØB),I=1,NH8)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     301 XFL(I,1) = 0.0
READ(5,302) LINLØD,(STØRY(I),I=1,16)
302 FØRMAT(14,16A4)
IF(LINLØD.EQ.0) GØ TØ 303
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XLS(N,M) = XLS(N,M) + BCT(K) *XSL(K,M)
                                                                                                                                                                                                                                                                                                   777 XSL(IL, J) = XSL(IL, J) + XLR(I, J)

IF (NØRING, EQ. O) GØ TØ 1150

DØ 1225 J=1, NØRING
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          READ(3) (BCT(J), J=1,NJTNH4)
DØ 717 M=1,NPRØB >
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XLS(I,J)=XFL(I,J)-XLS(I,J)
                                                                                                                                                                                                                                                                                                                                                             DØ 1226 I=1,4
DØ 1226 IK=1,NPRØB
                                                                                                                                                                                                                                                                                                                                               = 4*(JINB(J)-I)
                                                                                                                                                                                                                                                          IF (N2.EQ.2) I=NH4
DØ 777 IL=II, III
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       00 806 K=1,NJTNH4
                                                                                                                            DØ 777 N2 = 1,2
GØTØ (11,12),N2
II = (JI-1)*NH4+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DØ 811 J=1,NPRØB
DØ 811 I=1,NZ
                                                       XSL(I,J) = 0.0
DØ 777 NR=1,NREG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DØ 301 J=1,NPRØB
DØ 301 I=1,NZ
                             DØ 991 J=1,NPRØB
DØ 991 I=1,NJTNH
                                                                                                                                                                                                                               1) 0 777 J=1, NPRØB
                                                                                                                                                                                                  II = (J2-1)*4+1
                                                                                    J1 = JRTIC(NR)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XLS(N,M) = 0.0
                                                                                                                                                                        111= 11+NH4-1
                                                                                                                                                                                                                  I - 5HN+11 = I I I
                                                                                                                                                                                                                                                                                                                                                                                                                                                             DØ 876 N=1,NZ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           READ(5,2000)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   806 XLS(N<sub>7</sub>M) :
717 CØNTINUE
876 CØNTINUE
REWIND 2
                REWIND 3
                                                                                                                                                                                                                                                                                                                                                                                                                      CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                   CONTINUE
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                                                                                     A-CONVENTIONAL FORTRAN DOUBLE ARRAY CONTAINING MATRIX TO BE INVERTED
                                                                                                                     SINGLE ARRAY DIMENSIONED AT LEAST TO M
FIRST DIMENSION OF A,NOT LESS THAN M
ERROR INDICATOR, SET TO ZERO AFTER SUCCESSFUL EXECUTION.
.... RBUTINE **D15 ** ABACUS UPDATED 07/19/72 .....
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          A(I_1,J) = A(I_1,J) + TEMP1*A(K_1,J)
                                                                                                                                                                                                                                                                                                                                                         IF (PIVØT) 140,130,140
                                                                                                                                                                                                                                                                                                     110 PIVØT. = ABS(A(I,K))
                                                                                                                                                                                      OIMENSION A(MIO, 1)
INTEGER LOC(1)
                                                                                                                                                                                                                                                                      DØ 120 I = K,N
IF (PIVØT - AB
                                                      MATRIX INVERSION
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            EMP1=A(K,K)
                                                                                                                                                                                                                                                                                                                                                                         130 NIX = -1
GØ TØ 210
                                                                                                                                                                                                                                                                                                                                         120 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          180 A(I,J) = 190 CØNTINUE
                                                                                                                                                                                                                         100 N = M
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          170 TEMP
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SUBROUTINE INITAL

As a result of the matrix operations performed in REGMAT, the SKI22, the XK2221, and the XK22I2 arrays for each region are passed to INITAL. The XK1112 and XL1 arrays for each segment, resulting from the matrix procedures in SEGMAT, are also passed to INITAL. The region end deflection matrices, DRE, which were formed in STRMAT or BCVECT are transmitted to INITAL.

Following appropriate matrix operations upon these arrays, the force initial conditions, the FICS array, and the deflections initial conditions, the DICS array, are produced. These arrays combine to form the YICS matrix, which contains the true initial conditions for the structure to be analyzed.

The pertinent counters in the subroutine are:

NS = segment counter

NR = region counter

FORTRAN	CODE
T. OT/TT/WW	ינעטט

ENGINEERING SYMBOLS (REF. 1)

XK2221 MATRIX .

XK22L2 MATRIX

DSE ARRAY

XKlll2 MATRIX

ROTD MATRIX

DICS ARRAY

XL1 ARRAY

ROT MATRIX

FICS ARRAY

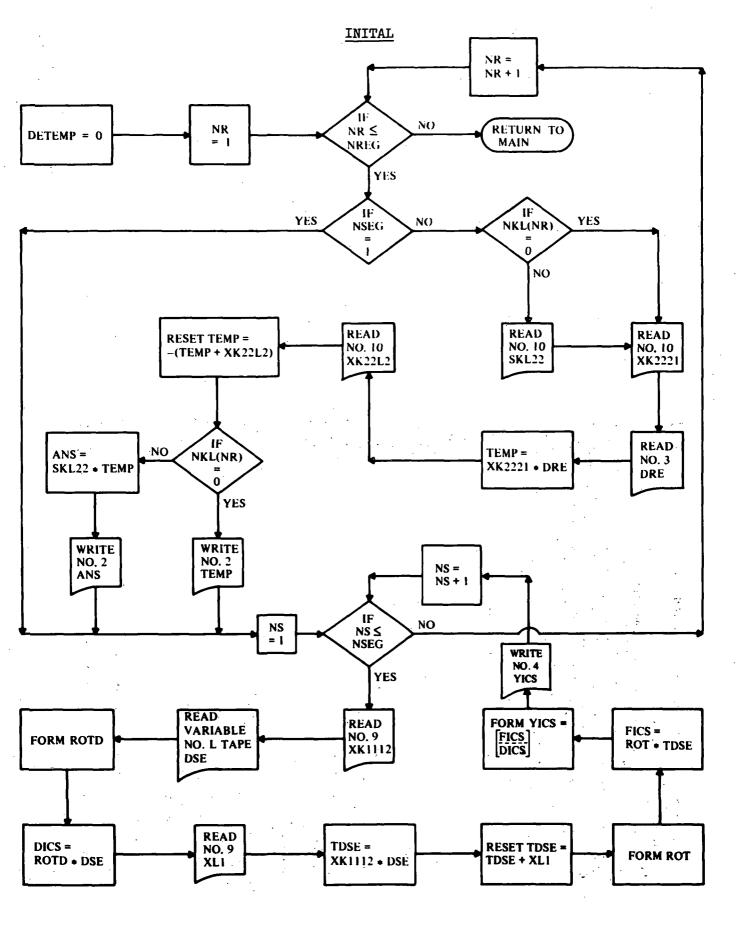
$$\begin{bmatrix} \mathbf{A} \\ \mathbf{K}_{22} \end{bmatrix}^{-1} \quad \begin{bmatrix} \mathbf{K}_{21} \\ \mathbf{K}_{22} \end{bmatrix}$$

$$\begin{bmatrix} IDT \end{bmatrix}^T$$

$$\{ \ell(i) \}$$

$$\left[\text{IFT} \right]^{\text{T}}$$

 $\{f(i)\}$



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                                                                                                                                                                                              COMMON NST(30), NKL(30), NXMAT(20), SAVJTC(30), SAVSTP(30), JRTIC(30)
COMMON JRSTOP(30), NREG,NMPT, NRC, NSC, NIX, IERROR, KGEOM, IGEOM, ISTTAB
COMMON KELVIN, IBEGIN, NPROB, NSEG, NERROR, Q, THICK, NOJS, NLINKS, NLCASE
                                                                                                                                                                                                                                                                                                                                                                               DIMENSION XL1(4,2), RØT(4,4), FICS(4,2), SKL22(112,112), ANS(112,2)
                                                                                                                                                                                                                                                                                                        DIMENSION XK2221(112,8), DRE(8,2), TEMP(112,2), XK22L2(112,2)
DIMENSION XK1112(4,8), DSE(8,2), RØTD(4,4), DICS(4,2)
                                                                                               DBUBLE PRECISION SAVIC, TIC, PHI, STOP, RESTOP, RTICK COMMON STORY (16), XMAT(110,10), STD(10), SADUS(30), RADUS(30)
                                                                                                                                                                           COMMON XN, TEFREE, TIC, PHI, STOP, RESTOP, RTICK, G1, XNL(2), NH
                                                                                                                                                                                                                                                                                COMMON NTSKL, NZ, NBCI, LINPUT, NTRKL, NPASS, XNI, KBC, NRINGS
** ABACUS UPDATED 07/24/72 ....
                                                                                                                                                                                                                                                                                                                                                                                                                                 EQUIVALENCE (DSE(1), DRE(1)), (XK2221(1), XK22L2(1))
FQUIVALENCE (SKL22(1), XK1112(1)), (YICS(1), TDSE(1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         FØRMAT(1H ,8(E14.7,2X)/(3X,8(E14.7,2X)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EMP(I,J)=TEMP(I,J)+XK2221(I,K)*DRE(K,J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         READ(10)((XK22L2(1, J), J=1, NPRØB), I=1, M8)
                                                                                                                                                                                                                                                                                                                                                                                                            EQUIVALENCE (RØT(1), RØTD(1)), (TIC, TICK)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 READ(10) ((XK2221(1,J),J=1,NH8),I=1,ME
READ(10) (SAVJTC(1),SAVSTP(1),I=1,NSEG)
                                                                                                                                                    COMMON TADUS(30), UADUS(30), SAVTIC(900)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         (10) (SKL22(I,J),J=1,JSKL22
                                               INTEGER SAVJIC, SAVSIP, Q, THICK
                                                                                                                                                                                                                                                                                                                                                          DIMENSION TOSE(8,2), YICS(8,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                READ(3) (ORE(1,J),J=1,NPRØB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           .0.3 = NST(NR) + NKL(NR) + 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       F(NKL(NR).EQ.0) GØ TØ 415
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           JSKL22 = 4#(NBJ-2-NKL(NR))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               F (NSEG.EQ.1) GØTØ 703
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IF (NSEG.EQ.1) GBT# 999
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   F (NH.NE.0) GØ TØ 510
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                M8=4*(NØJ-NKL(NR))-8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   SKL22 = 4#(NØJ-2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               425 I=1,1SKL22
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    38 100 NR=1, NREG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               UM 101 J=1,NPRBB
**016
                                                                          NTEGER XN1, XN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            DØ 101 K=1,NH8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        THUADSUSTED TO
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        1=11,11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TEMP(1,1)=0.0
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        MSEG=NSI(NR)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              NH41=NH4+1
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DØ 391 N=1,NSEG
IF((N.EQ.1.ØR.N.EQ.NSEG).AND.SAVJTC(N).GT.SAVSTP(N)) GØ TØ 370
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                                                                                                                                                                                             DØ 445 K = 1,JSKL22
ANS(I,J)=ANS(I,J)+SKL22(I,K)*TEMP(K,J)
                                    DØ 102 J=1,NPRØB

DØ 102 I=1,M8

TEMP(I,J)= -(TEMP(I,J)+XK22L2(I,J))

IF(NKL(NR).EQ.O) GØ TØ 435

DØ 445 I = 1,ISKL22
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              WRITE (2) (TEMP(1,J),J=1,NPRØB)
CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DØ 396 1=5,8
WRITE (2) (DRE(1,J),J=1,NPRØB)
                                                                                                                                                                                                                                                                                                   N.NE.1.8R.K.NE.1) G010 393
                                                                                                                                                                                                                                                                                                                              194 I= 1,4
E (2) (ORE(1,1),J=1,NPR0B)
0 398
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 372 WRITE(2) (TEMP(1,J),J=1,NPRØB)
2376 DØ 373 I=1,4
373 WRITE(2) (DRE(1,J),J=1,NPRØB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    WRITE(2) (ANS(I,J),J=1,NPRØB)
GØ TØ 376
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     370 IF(N.EQ.NSEG) GØ TØ 380
IF(NKL(NR).EQ.O) GØ TØ 375
DØ 371 I=1,4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         F(NR1.EQ.0)GBT88
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512 XK22L2(1,J)=0.0
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396 WRITE (2)
398 CØNTINUE
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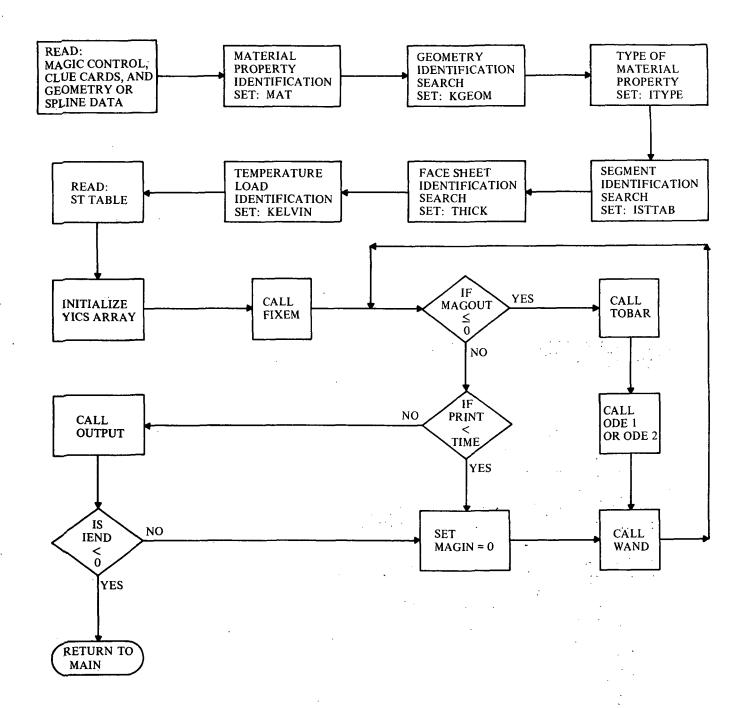
107

201 CONTINUE
AEWIND 2
100 CONTINUE
REWIND 4
REWIND 4
REWIND 8
REWIND 8

SUBROUTINE LEBEGE

The subroutine link LEBEGE receives the YICS array for each segment from INITAL via Tape #4. The subroutine FIXEM is called to integrate the differential equations of each segment, under true load conditions. FIXEM is identical to subroutine SETUP, while WAND corresponds to subroutine MAGIC and only consideration of the OVERLAY structure dictates the change in names. The subroutines TOBAR, TEMOEG, PLYCO, and PLYNE are similarly equivalent to ROBOT, GEOMET, PLICO, and PLINE discussed previously.

The results of the final integration sequence are the forces and deflections at the beginning, intermediate, and end points of each segment. In the first pass, first cycle, the prestress and predeformation states are printed from this routine. In other passes the U, V, W eigenvectors are printed, providing convergence has been reached.



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                                                                                                                                                                                                                                                                                                                                                                                                  80017
                                                                                                                                                                                                                                                              KELVIN, IBEGIN, NPRØB, NSEG, NERRØR, Q, THICK, NØJS, NLINKS, NLCAṢĒ
NTSKL, ŅZ, NBCT, LINPUT, NTRKL, NPASS, XNI, ĶBC, NRINGS
                                                                                                                                                                                                                                         JRSTØP(30), NREG, NMPT, NRC, NSC, NIX, IERRØR, KGEØM, IGEØM, ISTTAB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          M, I, SITIN, SITØUT, SIPIN, SIPØUT, TPT IN, TPTØUT, ZBRIN, ZBRIN, ZBRØUT, SCRIPA, SCRIPI, SIFIN, SIFØUT, TZEPH, TZETH
                                                                                                                                                                                                                                                                                                                                                                                                                                                            S,SN,CS,SNSQ,CSSQ,TAN,SEC,CN,XICS,XISN,TN,
XIRØ,XIRØSQ,XISNRØ,XICSRØ,CNIRØ,SNIRØ,CSIRØ,
XIRI,XIR2,CSIR1,CSIR2,SNIR1,XIRISQ,R2SQ,RØ,BESQ,
                                                                                                                                                                                                                                                                                                                                                                                                                                       YANTH, YAMTH, YAMPT, YANPT, YABPH, YAQPH, YAQTH, YAJPH,
                                                                                                                                                                                                                    NST(30), NKL(30), NXMAT(20), SAVJTC(30), SAVSTP(30), JRTIC(30)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XNUTP, XNUPT, XC11, XC22, XC15, X033, XD22, XD21, XD12,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XNTTH, XNTPH, XMTTH, XMTPH, XFTHLO, XFPHLO, XFZELO,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XMTHLD, XMPHLD, ETHET(2), EPHI(2), XGPT(2), ALPHTH(2), ALPHPH(2),
                                                                                                                                                                                                                                                                                                           /NAM1/ FACE(4), STRGØ(7), THERM(4), MATER(3), SEGTAB(12)
                                                                                                                                                                                                                                                                                                                                                     /SNILPS/ ANG, PSI(100), RAD(100), CUR1(100), CUR2(100),
                                                                                                                                                COMMON STORY(16), XMAT(110,10), STD(10), SADUS(30), RADUS(30)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (XMTTH, XMTETH), (XMTPH, XMTEPH), (XNTTH, XNTETH),
                                                                                                                                                                       CØMMBN TADUS(30),UADUS(30),SAVTIC(900)
CØMMBN XN,TEFREE,TIC,PHI,STØP,RESTØP,RTICK,GI,XNL(2),NH
                                                                              DØUBLE PRECISION SAVTIC,TIC,PHI,STOP,RESTOP,RTICK DØUBLE PRECISION DTAU,DIFF,STEP,DELTA,TIME,DTIME DØUBLE PRECISION YNEW,YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DIMENSION XKF(128), TBDEL(16), FWDEL(16), YCØRR(16)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       , XNPHI, BETTA, ZETTA, SAVY (8), XC16
** ABACUS UPDATED 07/24/72
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XK11, XK12, XK21, XK22, XK33, XD11,
                                                                                                                                                                                                                                                                                                                                                                                                                     YPRED(16), YDØT(16), YASAVE(16),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            DIMENSION LST(13), YDEV(16), YICS(16), YNEW(16)
                                           INTEGER SAVJTC, SAVSTP, SEGTAB, Q , THICK, TYPE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              RØSG, XNSQ, BETA, RI, RZ, SI, RIDØT, RISQ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     FBRMAT(1H ,8(E14.7,2X)/(3X,8(E14.7,2X)))
                                                                                                                                                                                                                                                                                                                                                                           DRIDP(100),21(14),RI(14),NRZIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          FOUIVALENCE (XSAVY(1,1), SAVY(1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DIMENSIØN ST(72,31), XLAYER(10)
DIMENSIØN XSAVY(3,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               IFIJNSC.LE.NSTIJAM)) GØ TØ 1727
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     CQUIVALENCE (YNEW(1), XKF(1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (XNTPH, XNTEPH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (XNPHI, XNPI)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             IF (NRNG.EQ.O) GØ TØ 1900
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DIMENSION TMPAV(5), RWD(8)
                                                                                                                                                                                                                                                                                                                                /ARING/ NRING(28)
                                                                                                                                                                                                                                                                                                                                                                                                  /MAGIO/ KKNI
                    SUBRBUTINE LEBEGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 KSC # KSC + NST(I)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      NRNG = NRING(JAM)
                                                                                                                                                                                                                                                                                                                                                                                                                     COMMON /LASTEQ/
  ROUTINE **D17
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DØ 451 I=1,NREG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               EQUIVALENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          + 3S7 = 3S7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   FOUTVALENCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (MTPH = 0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          JNSC = JNSC + 1
                                                                INTEGER XN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 REWIND 1
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   JNSC =0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      = Hdlnx
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                                                                                                                                                                                                                    COMMON
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DD 1/25 I=1,NNKR REAG(1) DUMLNK GØNTINUE		!	
JAM=JAM+1 JNSC=1		1800710	
CONTINUE RFAD(1) RG0.ANG.STORY		1800730	
DTAU, DIFF, STEP, D		1800750	
IF (RG0.EQ.14.0) G0 0 82 READ(1) G1.62.63		1800770	
8		1800780	
READ(1) NRZIN, (ZI(J), RI(J), J=1,NRZIN)		1800790	
CENTINGE READ(1) TYPE, HLAYR, SHEET, INTERP, RANKIN, TEFREE, NP		1800810	
5		1800820	
EPSIL #1.0E-US		1800830	
RGØ		1800850	
WRITE(6,1726)		1800860	
111)		1800870	
IE.(JNSC.EQ.1) WRITE(6,606) JAM,NST(JAM),NKL(JAM) FORMATI.//SAX.13HREGIØN NUMRER.[3//35X.]OHTHERE ARF .I2.14H	SEGMENT	1800880	
12,35H KINEMATIC LINKS WITHIN THIS REGION)		1800900	
-		1800910	
NOMBER SIZECASIONSCONENI CODE SIZE		1800930	
MATERIAL PROPERTY IDENTIFICATION		1800940	
DB 501 I=1,NMPI IF (HLAYR-STD(I)) 501,502,501		1800950	
		1800970	
GBTØ 503 >		1800980	
GBTB 8036		1801000	
	,	1801010	
SMETRY I		1801020	
DØ 504 1=1,f feroca-stroca(11) 504,505,504		1801040	
		1801050	
GØTØ 8086 ·		1801060	
		1801070	
GEBM * 0 E /kggam follom kgfam follolag.kgfam.fols.gam.fols) 1	IGFOM =1	1801080	
(KGEØM.EQ.3) IGEØM=2		_	
(KGEØM.EQ.4) IGEØM=3		= :	
- KG		-	
00 506 [=1,3		1801150	
		15	
GBTB 8087		16	
YPE=1		1801170	
08 510 1=1,12		1801190	
10101010101		1801200	
GØ TØ 8088		21	
ISTTAB=1		1801220	

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801270
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                                                                                                                                  GB TR (430,430,420,420,420,420,425,425,425, 430,430,430),ISTTAB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        IF (NLC.GT.1.AND.LST(1).NE.O.AND.LST(JT).NE.O) GØ TØ 8008
                                                                                                                                                                                                                                                                                                                                                                        F (ISTTAB.EQ.12) NRØW = 14
F (KBC.NE.O) NRØW = NRØW+2*NLCASE
                                              TEMPERATURE LOAD IDENTIFICATION
IF (SHEET.EQ.FACE(I)) GBIB 509
                                                                    IF (RANKIN. EQ. THERM(I)) GOTO 402
                                                                                                                                                                                                          LINEAR ANALYSIS IDENTIFICATION
                                                                                                                                                                                                                                                                                                                                                                                                            (ST(I, 1), J=1, NP)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   KEAD(1) (LST(J), J=JJ,JJJ)
                                                                                                                                                                                                                                                                                                                                                                                                                                                          IF (KBC.NE.0) GB TB 590
                                                                                                                                                                                                                                                                                                                                                             TTAB.EO.11) NRØW
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             23 [F(LST(JJ))8031,22,21
21 L=L+1
22 [F(JJ.E0.JJJ) 6010 24
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        1F(JJ.EU.JJJ) G0T0 24
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JT = JJ
                                                                                                                                                                                                                                                                                                                                                                                                 I=1,NKOW
                                                                                                                                                                                                                                                                                                                                                                                                                                   DØ 750 JJ=1,12
                                                            00 401 1=1,4
                                                                                                                                                                                                                                     NROW = THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                             LST(JJ) = 0
                                                                                                                                                                                   430 KLUE1=THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      NRK - NROW
                       GØTØ 8089.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             = LST(JJ)
                                                                                               COTO 8090
KELVIN=I
                                                                                                                                                                                                                        IANLYZ =
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           508 CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                         K-NROW+1
                                                                                   CONT INUE
                                                                                                                                                                                                                                                                                                                                                                                                106 90
                                  509 THICK=1
                                                                                                                                                                                                                                                                                                                                                                                                           READ(1)
                                                                                                                                              KLUE2=2
                                                                                                                                                                     KLUE2=3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               KEAD(1)
                                                                                                                      KLUE2=1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    19 11=11+
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1801840 1801850 1801860 1801870 1801880 1801890 1801950 1801950 1801950 1801950	1801970 1801980 1802090 1802000 1802020 1802030 1802030 1802050 1802070 1802070 1802070 1802070 1802110 1802120 1802130	1802170 1802231 1802231 1802220 1802230 1802240 1802240 1802240 1802240 1802240 180230 1802330 1802330 1802330 1802330 1802330 1802340 1802340 1802340 1802340 1802340
W = K-1/	,11X,-ØMEGATH-)) R 2- RA 2- EGA THETA8X.	AV; AV; SAVY EQNS, DTAU, EPSIL, DELTA, ERR, TIME, BOT, YNEW, YDEV, FWDEL, TBDEL) NS, DTAU, EPSIL, DEL TA, ERR, TIME, ØT, YNEW, YDEV, FWDEL, TBDEL) SAVY AVY(J1,K1), J1=1,3), K1=1, NLCASE)
CONTINUE IF (LST(JT).EQ.0) GW TW 660 KZ = K + LST(1) -1 K = KZ + 1 CONTINUE F (NLC.EQ.1.AND.LST(1).EQ.0) JJJJJJ+1 JJJJJ+1 CONTINUE CONTINUE CENTINUE READ(1) 15,SAVJTC(15),SAVSTP(1 NSAVE = NRW JJ-NLCASE*6	JJSNLCASSE*0 LT=0 DØ 15 J=1,JJ LT=1T+LST(J) NEQNS=8*NPRØB TIC = ST(1,1) STØP = ST(1,NP) READ(4) (YICS(I),I=1,NEQNS) NCVC=0 NSAVE=NRØW IEND=0 DTA=DTAU DTA=DTAU DTA=DTAU DTA=0 NRITE(6,656) IF (NH-EQ.0) NRITE(6,656) IF (NH-EQ.0) NRITE(6,622) W FØRMAT(IH+,80X,-NTHETA-,11X,-N IF (NH-NE.0) WRITE(6,651) IF (NH-NE.0) WRITE(6,651) IF (NH-NE.0) WRITE(6,651)	_ ~
72 660 71 17 590	15 656 656 173	661 662 673 663 673 673 673 673 673 673 673 673
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57 ST(IK,LL)=ST(IK,I-1)+(ST(IK,I)-ST(IK,I-1))*(ARG-ST(1,I-1))/(ST(1,1 1802650
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                                                                                                                                                                802611
                                                                                                                                                                                                                                                                                                                                                        ST(IK, LL) = ST(IK, I)
CONTINUE
THE UPDATED INTERPOLATED VALUES OF THE MATERIAL PROPERTY COEFFIC
IENTS ARE FOUND IN THE XMAT TABLE AND STORED IN THE XLAYER ARRAY
L=(MAT-1)*2+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IMPAV(IL0W)=(ST(L,LL)+ ST(L+1,LL)+ ST(L+2,LL) + ST(L+3,LL))/4.0
                                                                                                                                                             IF (NH.NE.O.AND.KKNT.EQ.4.AND.KBC.EQ.0) READ(13) SAVY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             TMPAV(ILØW)= (ST(L.LL)+ ST(L+1,LL))/2.0
TMPAV(IHIGH)=(ST(L+2,LL) + ST(L+3,LL))/2.0
U@ 105 IL=ILØW,IHIGH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      IF (KELVIN .NE. 1)GØ TØ 85
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GBTB (91,92,93,93), KELVIN
ARG= TMPAV(IL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              IF(KELVIN .NE. 1)GØ TØ 81
IF(THICK.NE.1)GØ TØ 83
                                                                                                                                                                                                         F(ARG-ST(1,1)) 52,55,51
52 FF(1-1) 55,55,54
51 CØNTINUE
IF(IEND.LT.0) GBTB .150
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          121 IF (I-2) 8007,8007,124
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ARG = ST(NRBW+1,LL)
                                                                                                                                                                                                                                                                                                                                            55 UB 58 IK=2,NTBTAL
58 ST(IK,LL)=ST(IK,I)
80 CBNTINUE
                                          65 OTIME=STOP-TIME
                                                                                                                                                                                                                                                                                                                                                                                                                                                     III=NXWAT(L+1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              TMPAV(1) = ARG
UØ 104 I = 2,10
                                                                                                                                                                                              OØ 51 I=1,NP
                                                                                                                                                                                                                                                                                                                 1)-51(1,1-1))
                                                                                                                                                                                                                                                                                                                                                                                                                                      ( I =NXMAT(L)
                                                                                       NC YC = NC YC + 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  L=NR.BW + 1
                                                           UELTA=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           IHIGH = 1
                                                                                                                   GBTB 60 PHI=TIME
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          COTO 8067
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  GØ TØ 85
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                                                                                                                                                                                                                                                                     GØ TØ 55
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    L00P = 2
                                                                                                     MAGIN=-1
              MAGIN=0
                                                                         G010 67
                              GØTØ 60
                                                                                                                                                                             LL=NP+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      GØTØ 94
                                                                                                                                                 ARG=PHI
                                                                                                                                                                                                                                                                                                                                 GØ 10 80
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  LL=NP+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.00P=1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             I - MØ - I
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                99
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             803070
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                                                                            XLAYER(M)=XMAT(J,[-1)+(XMAT(J,1)-XMAT(J,1-1))*(ARG-XMAT(II,1-1))/
(XMAT(II,1)-XMAT(II,1-1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ALPHPH(IL)= ALPHTH(IL)
XGPT(IL)= ETHET(IL)/(2.0*(1.0+ XNUPT))
GØ TØ 105
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             ALPHS = XLAYER(10)
XNUPT = ETHET(IL) * XNUTP/EPHI(IL)
                                                                                                                                                                                                                                          XGPT(1) = ETHET(1)/(2*(1+ XNUPT)
XGPT(2) = ETHET(2)/(2*(1+ XNUPT)
                                                                                                                                                                                      GØ TØ (115,115,112,113,114),LØØP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XNUPT= ETHET(IL)* XNUTP/EPHI(IL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  GØ TØ (117,107,108,281,118),LØØP
                                                                                                                                                                                                                                                                                    XNUTP = XLAYER(3)
XNUPT = ETHET(1)*XNUTP/EPHI(1)
                                                                                                                                                                                                                                                                                                                                                                                                         GB. TØ(101, 102, 103), ITYPE
                                                                                                                                                                                                                  IF(ITYPE.NE. 1)GØ TØ 131
XNUPT= XNUTP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ETHET(IL) = XLAYER(1)
EPHI(IL) = XLAYER(2)
XNUTP = XLAYER(3)
ALPHTH(IL) = XLAYER(4)
ALPHPH(IL) = XLAYER(5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ALPHTH(IL) = XLAYER(4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ALPHPH(IL) = XLAYER(5)
                                                                                                                                                                                                                                                                                                                                                                                                                                               ALPHTH(IL)= XLAYER(3)
EPHI(IL) = ETHET(IL)
XNUPT= XNUTP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ETHET(IL) = XLAYER(I)
                                                                                                                                                              XLAYER(M)= XMAT(J,1)
                                                                                                                                                                                                                                                                                                                                                                                                                         ETHET(IL) = XLAYER(I)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 XGPT(IL) = XLAYER(6)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            KGPT(IL) = XLAYER(6)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     EPHICIL) = XLAYER(2)
XNUTP= XLAYER(3)
               XLAYER(M)=XMAT(J,1)
                                                                                                                                                                                                                                                                                                                                                                                                                                    =XLAYER(2)
                                                                                                                                                                                                                                                                                                                                                                  ALPHR = XLAYER(9)
ER = XLAYER(7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ALPHR = XLAYER(9)
                                                                                                                                                                                                     XNUTP= XLAYER(2)
                                                                                                                                                                                                                                                                                                                                          ALPHS=XLAYER(10)
                                                                                                                                                 DØ 922 J=L, III
  DØ 122 J=L, III
                                                                 00 125 J=L, III
                                                                                                                                                                                                                                                                                                                            ES= XLAYER(8)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ER= XLAYER(7)
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L = NRØW+1
                                                                                                                                                                                                                                                                                                                                                        GØ TØ 106
                                                                                                                                     = [1 + ]
                                                                                                                                                                                                                                                                       GØ TØ .106
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                                                                                                                                                                                                                                                                                                              GØ TØ 106
                                        GØTØ 111
                                                                                                                        GØTØ 111
                                                                                                       125 M=M+1
                                                      124 L=[1+]
                                                                                                                                                                                                                                                                                                                                                                                                                                     KNUTP
                                                                                                                                                                             MIN MA
                           122 M=M+1
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T0K,DEGRES,C2,G3,T1ME)
IF (NIX.NE.O) G0 T0 9999
                                                                                                                                                                                                                                                      . 10 .AND. ISTTAB .LE. 12)CTH = ST(7,LL)
                                                                                                                         IF(ISTTAB.GE. 10.AND. ISTTAB.LE. 12)CPH = ST(6.LL)
IF(CPH .LE.0)GØ TØ 284
                                               .EQ.3 .AND. ISTTAB .GE. 31GB TØ 109
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               IF(ITYPE.EQ.3.AND.XK12.EQ.0.) GB TB 8102

IF(ITYPE.EQ.3.AND.XK21.EQ.0.) GB TB 8103

IF(XK22.EQ.0.0) GBTB 8104

IF(XK33.EQ.0.0) GBTB 8105

IF(XD11.EQ.0.0) GBTB 8106
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              (F(XD22.EQ.0.0) GBTØ 8109
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    IF(XD33.EQ.0.0) GBTB 8110
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      F(XK11.EQ.0.0) GBTB 8101
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                [F(NH.EQ.0) GB TB 350
                                                                                                                                                                                                                                                                                                     116 TMPAV(5) = ST(L+3,LL)
GB TB·85
                                                                                                                                                                            IMPAV(4) = ST(L+3,LL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            NLCSE=NLCASE
IF(NH.EQ.0) NLCSE=1
                                                                                                                                                 TMPAV(4) = ST(L,LL)
                                                                                                                                                                                                                                                                                                                                           ETHET(2) = ETHET(1)
ALPHTH(2) = ALPHTH(1)
                                                                                                                                                                                                                                                                                                                                                                    ALPHPH(2)=ALPHPH(1)
                                                                                                                                                                                                                                                                            (MPAV(5)= ST(L,LL)
                                                                                                                                                                                                                                                                                                                                                                                XGPT(2)= XGPT(1)
                                                                                                                                                                                                                                                                                                                                                                                            EPHI(2)= EPHI(1)
                                                                                                             CPH = ST(3,LL)
                                                                                                                                                                                                                                      CTH = ST(3, LL
IF(ISTTAB .GE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     F (KBC.NE.O)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       NPH! = 0.0
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DØ 7 M=1,JF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      KF PHL 1=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              KFPHL2=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  xFZEL1=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XF ZEL 2=0.0
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                                                                                                                                                                                        GØ TØ 85
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                                                 IF ( INTYPE
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107 LBBP= 3
                                      GB TB 82
                                                                                                 IHIGH =
                       HIGH=
                                                                                                                                                                                                                              CH16H=5
                                                                                                                                                                                                                                                                                                                                                                                                                                                          L=NP+1
                                                                                                                                                                                                                                                                  IF (CTH
                                                                         4 = 4000
                                                                                                                                                                                                     L00P=5
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           SAVY(M+6) = X1R0*(XN*YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)*SN)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      178 SAVY(M+6) = (1.0/(S*CS))*(XN*YPRED(1+4)+CS*YPRED(1+5)-SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  TF (ISTTAB.GE.3.aND.ISTTAB.LE.9) GØ TØ 4002
CALL ØDE1(XFPHL1,XFZEL1,XFPHL2,XFZEL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  179 SAVÝ(M+6) = XIRU*(XN*YPRED(I+4)-YPRED(I+6))
GØ 10 7
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              4002 CALL BDE2(XFPHL1, XFZEL1, XFPHL2, XFZEL2)
                                                                                                                                         IF (LST(IR).NE.0) K=K+LST(IR)
IF (LST(IR+1).EQ.0) GBIB 44
                                                                                                                                                                                               IF(LST(IR+2).EQ.0) GØTØ 45
                                                                                                                                                                                                                                                                                                              XMTHLD=ST(K,LL)
IF(LST(IR+5).EQ.0) GBTØ 48
                                                                                                                                                                                                                                          IF(LST(IR+3).EQ.0) GBTØ 46
                                                                                                                                                                                                                                                                                   46 IF(LST(IR+4).EQ.0) GØTØ 47
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SAVY(NN+1) = YPRED(1+1)
SAVY(NN+2) = YPRED(1+7)
GØ TØ (177,178,179),IGEØM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YPRED(1+6))
                                                                                                                                                                                                                                                                                                                                                                                  IF(JKL.EQ.2) GØ TØ 251
XFPHL1=XFPHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           IF (NH.NE.0) GØ TØ 8
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    RWB(N+3)=YPRED(I+7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        RWB(N+1)=YPRED(1+5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       RWØ(N+2)=YPRED(I+6
                           DØ 250 JKL=1,NLCSE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SAVY(NN) = YANTH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RWO(N)=YPRED(I+4)
                                                                                                                                                                                   XFTHLO=ST(K,LL)
                                                                                                                                                                                                                                                                                                                                                       XMPHLD=ST(K, LL)
                                                                                                                                                                                                                             XFPHLD=ST(K,LL)
                                                                                                                                                                                                                                                                      XFZELD=ST(K,LL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              IF (M.EQ.2) N=5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          NN = (M-1) #3+1
                                                                                                                                                                                                                                                                                                                                                                                                               XFZEL1=XFZELD
251 XFPHL2=XFPHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                             XFZEL2=XFZELD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              8001 IERRØR=8001
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           NERROR = 11
                                                       XFTHLD=0.0
                                                                                                               XMPHLD=0.0
                                                                                     XFZELD=0.0
                                                                                                  XMTHLD=0.0
                                                                      XFPHLD=0.0
                                                                                                                              [R=NL #6-5
                                                                                                                                                                                                                                                                                                                                                                       CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                           CONTINUE
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                          CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  GØ 10 77
                                          NL=NL+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      GØ TØ 7
K=NR.0W
                                                                                                                                                                       K=K+1
                                                                                                                                                                                                                                                             K=K+1
                                                                                                                                                                                                                                                                                                     K = K+1
              NF=0
                                                                                                                                                                                                                  K=K+1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                8 N=1
                             350
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G017 8888 8007 1ERRØR=8007 NERRØR=10 G0 T0 8888 8031 1ERRØR=8031 NERRØR=8031 NERRØR=8031 NERRØR=8036 NERRØR=8036 G0T0 8888 8086 1ERRØR=8036 NERRØR=8036 NERRØR=8086 G0T0 8888 8087 1ERRØR=8087 NERRØR=27 G0T0 8888 8089 1ERRØR=8089 NERRØR=27 G0T0 8888 8099 1ERRØR=8089 NERRØR=6990 NERRØR=6990 NERRØR=6990 NERRØR=6990 NERRØR=6990 NERRØR=6990 NERRØR=6990 NERRØR=8089 NERRØR=8089 NERRØR=8089 NERRØR=8089 NERRØR=8089 NERRØR=8089 NERRØR=8089 NERRØR=8089 NERRØR=8089

GØTØ 8888 8002 JERRØR=8002 NERRØR = 12 GOTO 8888 RIOZ IERROR = 8102 NERROR = 18 GOTO 8888 BIO3 IERROR = 19 GOTO 8888 BIO4 IERROR = 8104 NERROR = 20

G0TT 8888
1 TERROR = 8105
NERROR = 21
G0T0 888
1 TERROR = 22
G0T0 8888
G0T0 8888
1 GERROR = 22

8106

8105

GØTØ 8888 IERRØR = 8108 NERRØR = 24

8108

8107

GØTØ 8888 IERRØR = 8109 NERRØR = 25 GØTØ 8888

8109

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8110 1ERROR = 8110

NERROR = 26

8888 NIX=1

G T 0 9999

150 1F (LSC.LT.KSC) GØ TØ 902

9999 RETURN
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1900030
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900090
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                                                             FORTRAN IV
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                                                                                                                                                                                                                                                                                                                                                                                                    ENTRY WAND (MAGIN, MAGOUT, TIC, STEP, NEONS, DTAU, EPSIL, DELTA, ERR, TIME, DTIME, YICS, YPRED, YCBR, YDBT, YNEW, YDEV, FWDEL, TBDEL)
SUBROUTINE **D18 ** ABACUS UPDATED 07/07/72 .....
SUBROUTINE FIXEM (MAGIN, MAGBUI, TIC, STEP, NEQNS, DTAU,
EPSIL, DELTA, ERR, TIME, DTIME, YICS, YPRED,
YCARR, YDBT, YNEW, YDEV, FWDEL, TBDEL)
RUNGE KUTTA MAGIC (REVISED) SINGLE PRECISION
DIMENSION YICS( 1), YPRED( 1), YCGRR( 1), YDBT( 1), YNEW( 1),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     IF (DELTA)80, 5,80
D8 13 I = 1,NEQNS
IF (EPSIL*ABS(YCØRR(I)) + ERR - ABS(YDEV(I)) 14,13,13
                                                                                                                                   DØUBLE PRECISIØN YNEW,YPRED
DØUBLE PRECISIØN TIC,STEP,DTAU,DELTA,TIME,DTIME
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              YPRED(1) = TBDEL(1) + YDØT(1)
YPRED(1) = YNEW(1) + C(K)*DTIME*YDØT(1)
                                                                                       YDEV(1), FWDEL(1), TBDEL(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         - YPRED(I)
                                                                                                                                                                DATA C,D / .5,.5,1.0,.5,.0,.5/
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IF (DELTA)200,201,200

DTIME = 0.0078125

GB TB 225
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= YPRED(I)
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                                                                                                                     COMMON /MAGIQ/ KKNT
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                                                                                                                                                                                                                                            CØMMØN JRSTØP(30),NREG,NMPT,NRC,NSC,NIX,IERRØR,KGEØM,IGEØM,ISTTAB
CØMMØN KELVIN,IBEGIN,NPRØB,NSEG,NERRØR,Q,THICK,NØJS,NLINKS,NLCASE
                                                                                                                                                                                                                           COMMON NST(30), NKL(30), NXMAT(20), SAVJTC(30), SAVSTP(30), JRTIC(30)
                                                                                                                                                                                                                                                                                                      /LASTEQ/ YPRED(16), YD@T(16), YASAVE(16),
YANIH, YAMTH, YAMPT, YAMPT, YA@PH, YAQTH, YAJPH,
S.NIH, YAMTH, YAMPT, YAMPT, YA@PH, YAQTH, YAJPH,
S.SNIKS, SNSG, CSSQ, TTAN, SEC, CN, XICS, XISN, IN,
XIRO, XIROSG, XICSRO, CNIRO, SNIRO, SNIRO, SNIRO, SIRO, XICSRO, CNIRO, SNIRO, SIRO, RESQ, RO, BESQ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                M, I, SITIN, SITIOUT, SIPPIN, SIPPOUT, TPT IN, TPTOUT, ZBRIN, ZBROUT, SCRIPA, SCRIPI, SIFIN, SIFBUT, TZEPH, TZETH
 SUBRBUTINE TOBAR (ST.KLUEZ,NROW,NRW,LL,ER,ES,E1,E2,HI,H0,T,TII,

TOBATIK,TOK,DEGRES,G2,G3,TIME)
                                                                                                                                                                                                                                                                                                                                                                                                                                                    XMTHLD,XMPHLD,ETHET(2),EPHI(2),XGPT(2),ALPHTH(2),ALPHPH(2),
XNUIP,XNUPT,XC11,XC22,XC15,XD33,XD22,XD21,XD12,
                                                                                                                                                                                                                                                                                                                                                                                                                                 XNTTH, XNTPH, XMTTH, XMTPH, XFTHLO, XFPHLO, XFZELO,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             COMMON /SNILPS/ ANG, PSI(100), RAD(100), CURI(100), CUR2(100),
                                                                                                                                                             COMMON STORY(16), XMAT(110,10), STD(10), SADUS(30), RADUS(30)
                                                                                                                                                                                                    COMMON XN, TEFREE, TIC, PHI, STOP, RESTOP, RTICK, G1, XNL(2), NH
                                                                                                                                                                                                                                                                                    COMMON NTSKL, NZ, NBCT, LINPUT, NTRKL, NPASS, XNI, KBC, NRINGS
                                                                                                                       DØUBLE PRECISIØN SAVTIC,TIC,PHI,STØP,RESTØP,RTICK
DØUBLE PRECISIØN YPRED,TIME
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      , XNPHI, BETTA, ZETTA, SAVY(8), XC16
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TØBØR ** ABACUS UPDATED 07/07/72
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GEOMETRY FOR ELIPSE(G3=0FFSET DISTANCE )
                                                                                                                                                                                                                                                                                                                                                                                                            RUSQ, XNSQ, BETA, RI, RZ, SI, RIDUT, RISQ,
                                                                                                                                                                                COMMON TADUS(30), UADUS(30), SAVTIC(900)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DR 1DP (100), 21(14), RI (14), NR 21N
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              R2 = A*SORT(1.0/(SNSQ+BESQ*CSSQ))
                                                           SAVJTC, SAVSTP, Q, THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   F (NLCASE.EQ.1) GØ TØ 800
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       SAVY(1) = ST(NRBW-L,LL)
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                                                                                INTEGER XNI, XNZ, XN
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IF(KGE0M.EQ.1.AND.BETA.NE.1.0.AND.SN.NE.0.0)R1DBT=3.0*(R2*BETA/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  RID0T=-XN3*A*(SN**XNEXP*CS/4.0)*(2.0/(1.0+SN**XN1))**XN5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  R2= A*(2.0/(1.0+SN**XN1))**XN2
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                                                                                   IF(G3 .6Q. 0.0)6# TB 7775
                                                                                                                                                                             CS = DC@S(PHI)
IF (SN.EQ.O.O) GØTØ 777
R2=R1-C/SN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             R1=(A/2.0) + (R2/A) + + XN3
                                                                                                                                                                                                                                                                                                                                                                             GEBMETRY FOR CYLINDER
                                                                                                                                 GEOMETRY FOR BGIVE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         GENERAL GEBMETRY
SN = DSIN(PHI)
                                                                                                                                                                                                                                                                                                                                                                                                                                                 MØDIFIED ELLIPSE
775 XNEXP=61
                                                                                               R100T = 3.0#G3
                                                                                                                                                                 SN = DSIN(PHI)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             SN = DSIN(PHI)
CS = DCØS(PHI)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  XN1=1.0+XNEXP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XN2=1.0/XN1
XN3=XN1+1.0
XN4=XN3+1.0
XN5=XN4/XN1
                                                                                                                                                                                                                                                                                                                                 R2=CS*SN*PHI
                                                                                                                     GØ TØ 7775
                                                                                                                                                                                                                                                                                              SN=SIN(G1)
                                                                                                                                                                                                                                                                                                                                                                                                                           R100T=0.0
                                                                                                                                                                                                                                                                                                                                                                                                                                   GBT0 7775
                                                                                                                                                                                                                                                                                                                                            RØ=PHI*CS
                                                                                                                                                                                                                                                                                                                                                       RIDØT=0.0
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                                                                                                                                                                                                                                                K100T=0.0
                                                                                                                                                                                                                                                                       GEOMETRY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         RØ=R2#SN
                                                                                                                                                                                                                                                                                                                      S1=1:0/S
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                                                                                                           RB = -63
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                                                                                                                                                                                                                                                                                                                                                                                                  SN=1.0
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                                                                                                                                             R1=61
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                                                                                                                                                        C=62
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                                                                                                                                                                                                                                        KB = RAD(J-1)+(KAD(J)-RAD(J-1))*SUB1/SUB2
K1 = CUR1(J-1)+(CUR1(J)-CUR1(J-1))*SUB1/SUB2
K2 = CUR2(J-1)+(CUR2(J)-CUR2(J-1))*SUB1/SUB2
K100T = DR1DP(J-1)+(OR10P(J)-DR1DP(J-1))*SUB1/SUB2
                     IF (ANG.EQ.A) IF (ARG-PHØ) 221,223,204
IF (PHØ-ARG) 221,223,204
221 IF (J-1) 8502,8502,224
204 CØNTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                  DEGRES = 0.0
IF(IGE@M.EQ.1) DEGRES = PHI * 57.29578
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 IF (KGEOM.EQ.4. ØK.KGEOM.EQ.3) GDIU 79
                                                                                                                                                                                                                                                                                                                                                                                                             *100T = - ((A**2)*0.5)*(R1*CS)/R0**2
                                                                                                                                                                                                                 SUB1 = ARG-PSI(J-1)
SUB2 = PSI(J)-PSI(J-1)
                                                                                                                                                                                                                                                                                                         ISATENSOID GEOMETRY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   XISN=1.0/SN
XISNRØ=1.0/(SN*RØ)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      X1CSRØ=1.0/(CS*KØ)
                                                                                                                                                                                                                                                                                                                                                                      R2 = A / SORT(SN)
R1 = 0.5 * R2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            x1R1SQ=1.0/R1**2
                                                                                                                          R100T = OR10P(J)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XIR0SQ=1.0/R0*#2
DM 204 J=1,100
                                                                                                                                                                                                                                                                                                                                  SN = DSIN(PHI)
                                                                                                                                                                                                                                                                                                                                             CS = DCØS(PHI)
                                                                                                                                                                                                                                                                                                                                                                                                                                                            RDSQ = R0**2
XNSQ=XN**2
CN=CS*SN
X1CS=1.0/CS
IN=SN/CS
                                                                                                                                                                                                                                                                                                                                                                                               RB = R2 # SN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RISO = R1##2
R2SO = R2##2
          PHØ = PSI(J)
                                                                                                  R1 = CUR1(J)
                                                                                                              R2 = CUR2(J)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  CN1RØ=CN/RØ
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                                                                                      RØ = RAD(J)
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                                                                         GB TB 8503
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                                                                                                                                      CB TB 7775
                                                                                                                                                                CØ TØ 8888
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                                                                                                                                                                                                                                                                                                                                                                                                                         7775 IAN=SN/CS
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MEANS DØ NØT AVERAGE, BUT INTERPØLATE, CØMPUTE
                                                                   GØ TØ (711,600,711,32,33,34,35,36,37,28,29,30),1STTAB
                                             COMPUTATION OF K AND D FOR MATERIAL PROPETY INPUT
                                                                                             GØ TØ (703,702,701,701), THICK
                                                                                                                                                                                                                                                                                                                                          RWAFI, RWAF2, RWAF3
HB = ST(10, LL)
                                                                                                                                                                                                                                                                                                      SPH = ST(10, LL)
STH = ST(11, LL)
                                                                                                                                                                                                                                                                               XIPH = ST(8,LL
                                                                                                                                                                                                                                 APH = ST(4,LL
ATH = ST(5,LL
                                                                                                                                                                                           HI= ST(12,LL)
GJPH= ST(2,LL)
GJTH= ST(3,LL)
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                                                                                                                                  HI= ST(2,LL)
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 XNTPH=0.0
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XD11=(XK11* H1**2)/12*+ H1*( ETHET(1) * ZBHIN + ETHET(2)*ZBHØUT)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   /PERM
XD22=(XK22* HI**2)/12<sub>*</sub>+ HI*( EPHI(1) * ZBHIN + EPHI(2)* ZBHØUT)
/PERM
NTEMP, MTEMP RANKIN=THINHØ MEANS INTERPOLATE, BUT DØ NØT CØMPUTE NTEMP, MTEMP
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (033= (HI**3*(XGPT(1)+XGPT(2)))/12.0+ HI*(XGPT(1)* ZBHIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         GØ TØ (103,42,103,42,47,49,42,47,49,42,47,49),ISTTAB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ZBRIN = (HI*(E1+3.0*E2)+Z.0*E2*I)/(Z.0*ESI)
ZBRBUT = (HI*(E2+3.0*E1)+Z.0*E1*I)/(Z.0*ESI)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XK33= HI*(XGPT(1)+ XGPT(2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     E1= (ETHET(1)+ EPHI(1))/2.
E2= (ETHET(2)+ EPHI(2))/2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TEMP3= (1.0-XNUPT * XNUTP)
PERM= TEMP3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             GØ TØ (42,47,49,41),THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XD22= TEMP2(12.0* TEMP3)
XK33= XGPT(1)* HI
XD33= XK33*HI**2/12.0
GØ TØ 55
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ETSUM= ETHET(1)+ ETHET(2)
XK11= ETSUM * HI/PERM
XK22= EPSUM * HI/PERM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   ZBHIN= (ZBRIN- HI/2.0)**2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  BHBUT=(28RBUT-HJ/2.0)**2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XD11= TEMP2/(12.0* TEMP3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EPSUM= EPHI(1)+ EPHI(2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            EMP2= TEMP1 # HI*#2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           TEMP1= ETHET(1) # HI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TEMP1= EPHI(1)* HI
TEMP2= TEMP1*HI**2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   XKII= TEMPI/TEMP3
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                                                                                                                                                                                                                                                                                              XD22 = ST(8,LL)
XD33 = ST(9,LL)
XC11 = ST(10,LL)
                                                                                                                                                                                                                                                                                                                                                                ST(10,LL)
                                                                                                                                                                                                                                                                                                                                                                                            ST(11, LL)
                                                                                                                                                                                                                                                                                                                                                                                                                        ST(12,LL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                    ST(13,LL)
                                                                                                                                                                                 XK22 = ST(4,LL)
                                                                                                                                                                                                                                                                       xD12 = ST(7, LL)
                                                                                                                                                                                                                                            XD11 = ST(6_1LL)
                                                                                                                    XK11=ST(2,LL)
XK12=ST(3,LL)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           x021 = x012
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          GØ TØ 103
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                                                         LBRIN = ((E1*H1**2)+(E2*H0**2) +(2.0*E2*H0*HI) +(2.0*E2*H0*T)) /
                                                                                         78R8UT=((E1+H1++2)+(E2+H8++2) +(2.0+E1+H8+H1) +(2.0+E1+H1+T)) /
                                                                                                                                                                                                                                                                            xD22= ( D22 +(HI*EPHI(I)*ZBHIN) + (HØ*EPHI(2)* ZBHØUT)) /PERM
                                                                                                                                                                                                                                              + (HØ*ETHET(2)*ZBHØUT))/PERM
                                                                                                                                                                                                                                                                                                         DETERMINE COMPLETE CONSTANTS DEPENDENT ON REINFORCEMENT CLUE
                                                                                                                                                                                                   XD33 = (XGPT(1)*HI**3*XGPT(2)*HG**3)/12.+HI*(XGPT(1)*ZBHIN)+
                                                                                                                                                                                                                   1 xGPI(2)*28HBUT*HB
011 = '(ETHET(1)*H1**3 + ETHET(2)*HB**3)/12.
                                                                                                                                                                                                                                               XDII=(U]1+ (HI*ETHEF(1)*2BHIN) + (HØ*ETHE
U22 = (EPHI(1)* HI**3 + EPHI(2)*HØ**3)/12.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       (C22= EASPH*CPH
XD22 = -XD22-E1SPH
XD33= XD33 + GJPH/(4.0*SPH)+ GJTH/(4.0*STH)
                                                                                                                                                      GRI= ER# 12/(2.0*(1.0 + XNUTP)*D)
                                                                                                                                                                                      XK33= XGPT(1)*HI + XGPT(2) * HØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     HL = 2.0*(ABS(ZETTA)-ABS(CTH))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XC.15 = 2.0*CTH*CØSB*SINB2*ED
                                                                                                                                       ZBHZUT = (ZBRØUT-HØ/2.0) **2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 xC22 = 2.0*CTH*CØSB**3*ED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              KC11 = CTH*SN2TØ4/CØSB*ED
                                                                                                                                                                                                                                                                                                                                                        IF(15TTAB .EQ.2)GB TB 103
                                                                                                                          ZBHIN = (ZBRIN-HI/2.0)**2
                                                                                                                                                                                                                                                                                                                                                                                                                                 GB TR (58,60,100),KLUE2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  12=(ATH**3.)/(3# HL**2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SN2TØ4 = 2*(SINB**4.)
                                                                            1 (2.0*(E1*HI+E2*HØ))
                                                                                                           1 (2.0*(E1*HI+E2*HØ))
              UNEQUAL FACE SHEETS
                                                                                                                                                                                                                                                                                                                                                                                                     EISPH= ES* XIPH/SPH
LISTH= ER* XITH/STH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       D= STH*(CØSB+SINB)
ED = ER*ATH/D
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   XD11= -X011- EISTH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            KK11= XK11+ EASTH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            K22= XK22+ EASPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     -XD11#XNUTP
                                                                                                                                                                                                                                                                                                                                                                                                                                                             ST CLUE(10,11,12)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SINB =SIN(BETTA)
COSB =COS(BETTA)
                                                                                                                                                                                                                                                                                                                                                                         EASTH=ER*ATH/STH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            KK12= XK11*XNUTP
                                                                                                                                                                                                                                                                                                                                                                                        FASPH=ES*APH/SPH
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             SN4TB2 = 4.*SINB2
XD22 = -XD22-2.0*CØSB**3*EDI-SN4TØ2*CØSB*GRI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XC22= EASTH*CTH* (CSB/SNB * 0NEC2B)
XD12=-XD11*XNUTP- EISTH*(SNB*0NEC2B/CSB)
XD11=-XD11- EISTH*SCB2
                                                                                                                                                                                                                                                                                                                                                                                                                                         XK12=XK11*XNUTP + (EASTH*SNB*@NEC2B/CSB)
                                                                                                         1*SINB2*EDI)-(SN4TØ2*CØSB*GRI )
XKI2= XKI1*XNUTP + (2.0*CØSB*SINB2*ED)
                                                          XD33 = XD33+((4.0*CØS(TB)*
1*2*GR1)/ CØSB) + (2.0*CØSB*SINB2*EDI)
XD12 = -XD11*XNUTP-(2.0*CØSB
                                                                                                                                                                                                                                                                                                                                                                                          UNEC2B=(1.0+ CS2B)/2.
SCB2 =(SNB-CS2B*SNB + 2.)/(2.0*CSB)
SN2B =SIN(TBETTA) /2.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XD22 = -XD22-EISTH*(CSB/SNB*ØNEC2B)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XCII= (EASTH*CTH* SCB2 )
XCI5=EASTH*CTH*( SNB* ØNEC2B/CSB )
XCI6=EASTH*CTH*SN2B
                                                                                                                                                                                                                                                                                                                                                                                                                                                        XK11=XK11+ EASTH*SCB2
XK22=XK22+ EASTH*(CSB/SNB*ØNEC28)
XK33=XK33+ EASTH* SN2B
                                                                                                                                                                                      x011 = -x011-SN2T04*EDI/C0S8-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           GØTØ (716,714,715,714),KELVIN
                                                                                                                                       XK22=XK22+(2*CØSB**3*ED)
XK33=XK33+(2*CØSB*SINB2*ED)
                                                                                                                                                                       XK11=XK11+(SN2TØ4*ED/CØSB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TEMP12= ALPHTH(2)+ XNUTP
TEMP21= ALPHPH(1)+ XNUPT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  XD33= XD33+ EISTH*SN2B
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   717 1EMP11= ALPHTH(1)+
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TIK = ST(NRW+2, LL)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           III = ST(NRW+1,LL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         TOK = ST(NRW+3, LL
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GØ TØ 717
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                                                                                                                                                                                                     1 SN4TØ2*CØSB*GRI)
                                                                                                                                                                                                                                                                                                                                                                             CS2B= C0S(TBETTA)
                                                                                                                                                                                                                                                                              1SG CLUE (7,8,9)
                                                                                                                                                                                                                                                                                                                             SNB =SIN(BETTA)
CSB =CØS(BETTA)
                                             TB= 2.0* BETTA
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XD21 = XD12
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 XNTPH= [PHK1*0,5*(H1*1EMP61)+ EPHK2*0,5*(H0*TEMP62)
XMTTH = ETHK1*0,5*(H1**2*TEMP71/3.0+T1*H1*TEMP61)-ETHK2*0,5*(H0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XMTPH = EPHK1*0.5*(HI**2*TEMP71/3.0+TI*HI*TEMP61)-EPHK2*0.5*(HØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        XNTTH = (XK11/4.0 +TEMP1) + TEMP61 + (XK11/4.0+TEMP12) + TEMP62
XMTPH = (XK22/4.0 +TEMP2) + TEMP61 + (XK22/4.0+TEMP22) + TEMP62
XMTTH = TEMP10+(TEMP11+TEMP71 - TEMP12+ TEMP72)
                                                                                                                                                                                                                                                                                                                                                                                                                                                          FEMP8*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 TEMP8#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          - (ETHK2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XMTPH = (EPHK1 * TEMP8 * (HI*TEMP71/3.0+ TI*TEMP61)) - (EPHK2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         11 = (E2*H0**2-E1*H1**2+2.0*E2*H0*T)/(2.0*(E1*H1+E2*H0))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            'YØ = (E1*HI**2-E2*HØ**2+2.0*E1*HI*T)/(2.0*(E1*HI+E2*HØ))
XNTIH = ETHKI*0.5*(HI*TEMP61)+E1HK2*0.5*(HØ*TEMP62)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TEMP8 * (HI*TEMP71/3.0+ TI*TEMP61))
                                                                                                                                                                                                                                                                                                                      FEMP4 # (TEMP61 + TEMP62)
                                                                                                                                                                                                                                                                                                  TEMP4 * (TEMP61+ TEMP62)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XMTPH = TEM11 *(TEMP21*1EMP71 - TEMP22* TEMP72
                                                                                                                                                                                                                                                                                                                                                                                                                                                            TEMP8#TEMP61 + ETHK2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   TEMP8*IEMP61 + EPHK2
                                                                                                                                                                                                                                                                                                                                                             TEMPS. # (TEMP71
                                                                                                                                                                                                                                                                                                                                           TEMPS * (TEMP7)
                                                                                                                                                                                                                                                                                                                                                                                                  = (HI*(E2-E1)+2.0*E2*T)/(2.0*(E1+E2))
= (HI*(E1-E2)+2.0*E1*T)/(2.0*(E1+E2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      TEMP10=((-XK11*XD11)**.5)/(48.0**.5)
TEMP22= ALPHPH(2)+ XNUPT * ALPHTH(2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           [EM]] =((-XK22*XD22)**.5}/(48.0**.5]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              1 TEMP8*(HI*TEMP72/3,0+TØ*TEMP62))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             1 TEMP8*(HI*TEMP72/3.0+T@*TEMP62))
                                                                                                                 IEMP61= TII+ TIK-2* TEFREE
TEMP62= T00+ T0K-2* TEFREE
IEMP71= 2.0* TII +TIK-3*TEFREE
TEMP72= 2.0* T00 +T0K-3*TEFREE
                                                         ETHET(1) *TEMP11/TEMP3
                                                                                                THK2 = ETHET(2) *TEMP12/TEMP3
                                                                                                                                                                                                                                        CØ TØ (811,812,813,814), THICK
                                                                                                                                                                                                   [PHK] = EPHI(1) * TEMP21/TEMP3
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                                                                                                                                                                                                                     EPHK2 = EPHI(2) * TEMP22/TEMP3
                  EMP3 = 1-XNUPT *XNUTP
                                                                              EMP5 = HI*#2/24.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XMTTH = (ETHK1 #
                                       TEMP4 = HI /4.0
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             USE SPLICØ TØ REPRESENT RI(I) AS A FUNCTIØN ØF SØUT(I). THEN US
SPLINE TØ INTERPØLATE RACD AND CØRRESPØNDING DERIVATIVES. FRØM
THESE, COMPUTE THE IWØ PRINCIPAL RADII ØF CURVATURE,
                                                                                                                        INTERSECTION OF THE CORRESPONDING RI(I) AND
                                                                                                                                                                                                                                                                                                                                                                                                      PASS SPLINE CURVE THROUGH INPUT POINTS ON SHELL MERIDIAN, AND
                                  THIS SUBROUTINE CALCULATES THE GEOMETRY FOR A SHELL SEGMENT.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      NUMERICAL INTEGRATION (SIMPSONS RULE). SINCE SIMPSONS RULE REQUIRES AN EVEN NUMBER OF PORTITIONS, INTERPOLATE A POINT MIDWAY BETWEEN EACH PAIR OF POINTS USING SUBROUTINE PLINE.
                                                                                                                                                                                                  COMMON /SNILPS/ ANG, PSI(100), RAD(100), CUR1(100), CUR2(100),
                                                                                                                                                              - NUMBER OF (RI, ZI) PAIRS READ AS INPUT.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     CALL PLYNE (ZI,RI,NKZIN,CI,Z[(I)+DZ2,FAKE1,DRDZM,FAKE2)
SØUT(I+1) = SØUT(I) + DZ6*(FUN(DRDZ(I)) + 4.0*FUN(DRDZM)
                                                          VARIABLES ARE . . .
RI(I) - - DISTANCE FROM AXIS OF REV. TO POINTS.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       COMPUTE MERIDIANAL ARC LENGIH TO INTERPOLATED POINTS BY
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              CALL PLYNE (SØUT,RI,NRZIN,CI,S(I),RAD(I),RADD(I),RAUD2)
IF (ABS(RADD(I)),GT.1.0) RADD(I)=1.0
FACTOR = SQRT(I.0-RADU(I)**2)
                                                                                         ON SHELL MERIDIAN.
- DISTANCE ALONG AXIS OF REV. TO THE
                                                                                                                                                                                                                   DRIDP(100), ZI(14), RI(14), NRZIN
DIMENSIBN CI(4,13), DRDZ(14), SØUT(14), S(101), RADD(100)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   CALL PLYNE (ZI, KI, NRZIN, CI, ZI(I), FAKE1, DRDZ(I), FAKE2)
RØUTINE ** TEMBEG ** ABACUS UPDATED 07/07/72 ....
                                                                                                                                              THE AXIS OF REV.
                                                                                                                                                                                                                                                                                                                                                                                                                         CUMPUTE DR/DZ AT THESE PRINTS.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           CALL PLYC2 (SOUT, RI, NRZIN, CI)
                                                                                                                                                                                                                                                                          FUN(ARG) = SQRT(1.0 + ARG**2)
                                                                                                                                                                                                                                                                                                                                                                  IF (ANG.EQ.B) AMULT = -1.0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         FUN (DRUZ(1+1)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                            CALL PLYCØ (ZI,RI,NRZIN,CI)
                                                   THE INPUT VARIABLES ARE .
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         CLDH1 = SØUT(NRZIN) /99.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   022=(21(1+1)-21(1))/2.0
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               S(I) = FLØAT(I-1)*ØLDHI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        URZ(I) = FACTBR/RAG(I)
                                                                                                                                                                                                                                                                                                               = 3.1415926/180.0
                 SUBRBUTINE TEMBEG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NDELZ = NRZIN - 1
                                                                                                          - (1)17
                                                                                                                                                                 NRZIN -
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  DØ 60 1=1,NRZIN
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            GØ 110 [=1,100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CUR2 = 1/R2
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                                                                                                                                                                                                                                                                                                                                  DATA 8/-8
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                                                                                                                                                                                                     ORIGINAL) = (CURI(J-I)-CURI(J))/(PSI(J-I)-PSI(J))
CENTINUE
DRIDP(100) = DRIDP(99)
                                                                                                                                                                    1F (ANG.EQ.B) GW TW 190
URIDP(J-1) = (CURI(J)-CURI(J-1))/(PSI(J)-PSI(J-I))
                     CGSPSI = AMULT*RADD(J)
PSI(J) = ARCØS(CØSPSI)
SINPSI = -AMULT*RAD(J)*CUR2(J)
JF (ANG.EG.B) GØ TØ 179
PSI(J) = 2.0*3.1415926-PSI(J)
                                                                                            CURI(J) = -AMULT/CURI(J)
CUR2(J) = -AMULT/CUR2(J)
IF (J.EG.I) GØ TØ 180
                                                                                                                                                                                                                                                     ORIOP(J) = URIDP(J) #0.1
                                                                                                                                             IF (J.EQ.2) GØ TØ 181
110 CØNTINUE
00 180 J=1,100
CØSPSI = AMULT*
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               SUBRBUTINE PLYCB (X,Y,M,C)
SUBRBUTINE FØ DETERMINE C(1,K),C(2,K),C(3,K) AND C(4 K).
DIMENSION X(14),Y(14),A(14,3),B(14),Z(14)
DIMENSION D(13),P(13),E(13),C(4,13)
RBUTINE ** PLYCE ** ABACUS UPDATED 05/20/72 ....
                                                                                                                                                                                                                                                                                                         A(K,2) = 2.0*(P(K-1)+P(K))-P(K-1)*A(K-1,3)
                                                                                                                                                                                                          A(1,3) = D(1)/D(2)

A(2,3) = P(2)-P(1)*A(1,3)

A(2,2) = 2.0*(P(1)+P(2)) - P(1)*A(1,2)

A(2,3) = A(2,3)/A(2,2)

B(2) = B(2)/A(2,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  C(3,K) = Y(K)/D(K)-Z(K)*P(K)

C(4,K) = Y(K+1)/D(K)-Z(K+1)*P(K)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Z(1) = -A(1,2)*Z(2)-A(1,3)*Z(3)
                                                                                                                                                                                                                                                                                                                                                                                                                    B(M) = B(M-2)-A(M,1)*B(M-1)
                                                                                                                                                                                                                                                                                                                                                                                                        A(M,2) = -0-A(M,1)*A(M-1,3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   Z(K) = B(K)-A(K,3)*Z(K+1)
                                                                                                                                               10 E(K) = (Y(K+1) - Y(K))/D(K)
                                                                                                                                                                                                                                                                                                                        B(K) = B(K) - P(K-1) * B(K-1)

A(K,3) = P(K)/A(K,2)
                                                                                                                                                                            20 B(K) = E(K) - E(K-1)
A(1,2) = -1.0-D(1)/D(2)
A(1,3) = D(1)/D(2)
                                                                                                                                                                                                                                                                                                                                                                         0 = D(M-2)/D(M-1)

A(M,1) = 1.0+0+A(M-2,3)
                                                                                                               D(K) = X(K+1) - X(K)

P(K) = D(K)/6.0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   = 1.0/(6.0*D(K))
                                                                                                                                                                                                                                                                                                                                                      30 B(K) = B(K)/A(K,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                      Z(M) = H(M)/A(M,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   (K+1) #0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  C(1,K) = 2(K) *Q
                                                                                                                                                                                                                                                                                                                                                                                                                                                                     DØ 40 1=1 ,MN
                                                                                               0.0 10 K=1, MM
                                                                                                                                                              CØ 20 K=2,MM
                                                                                                                                                                                                                                                                                           08 30 K=3,MM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      DØ 50 K=1,MM
                                                                              MM = M-1
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                     SUBRECTINE FOR SPLINE FIT INTERPOLATION IN THE TABLE OF VALUES (X1,Y1) TO (XM,YM), WHERE M MAY BE AS LARGE AS 100, HERE THE
                                                      COMPUTED
                                                                                                                                                                                                                                                                                       70 DYDX=-3.C*(C(1,K)*(X(K+1)-XINT)**2-C(2,K)*(XINT-X(K))**2
                                                    CONSTANTS C(1,K),C(2,K),C(3,K) AND C(4,K) ARE ALREAD
                                                                                                                                                                                                                                                                                                                  D2YDX2=6.0*(C(1,K)*(X(K+1)-XINT)+C(2,K)*(XINT-X(K)))
                                                                                 SUBREUTINE ALSØ CØMPUTES DY/OX AND D2Y/DX2 AT XINT.
                                                                                                                                                                                                                                                                                                                                                               FERMAT (31H BUT OF RANGE FOR INTERPOLATION)
                                                                                                 UIMENSIGN X(14),Y(14),C(4,13)
[F (XINI-X(1)) 80,10,20
                                                                                                                                                                                        IF (XINT-X(K+1)) 60,40,50
ROUTINE ** PLYNE
                                                                                                                                                                                                       YINT = Y(K+1)
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90 FØRMAT (31H
                                                                       AND STERED.
                                                                                                                              VINT = Y(1)
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SUBROUTINES ODE1 AND ODE2

Subroutine LEBEGE calls either ODE1 or ODE2, as necessary, and various geometric and trigonometric clues, as well as the predicted values of the variables for the differential equations, are passed to this subprogram via label common area LASTEQ.

The equations in ODE1 and ODE2 are identical to those in subroutines DIF1 and DIFF2 respectively, with the addition of the auxiliary equations for YAQPH, and YAQTH. Subroutines ODE1 and ODE2 perform the final integration for each segment in the structure utilizing the initial conditions previously obtained, and return these values to LEBEGE via label common area LASTEQ.

The ODE1, ODE2 flow charts are identical to the DIF1, DIFF2 flow charts, respectively.

FORTRAN CODE	ENGINEERING SYMBOLS (REF. 1)
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YAQPH	Q_{ϕ}
YAQTH	Q _e
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 COMMON NST(30),NKL(30),NXMAT(20),SAVJTC(30),SAVSTP(30),JRTIC(30)
COMMON JRSTOP(30),NREG,NMPT,NRC,NSC,NIX,IERROR,KGEOM,IGEOM,ISTTAB
COMMON KELVIN,IBEGIN,NPROB,NSEG,NERROR,Q,THICK,NDJS,NLINKS,NLCASE
COMMON NTSKL,NZ,NBCT,TINPUT,NTRKL,NPASS,XNI,KBC,NRINGS
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XNUPT*YPRED(I+3)-(XD11-XNUPT**2*XD22)*X1RØ*(X1RØ*(XN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ZBRIN, ZBRØUT, SCRIPA, SCRIPI, SIFIN, SIFØUT, TZEPH, TZETH
                                                                                                                                                                                                                                                                                                                                                                                                                                                 YANTH, YAMTH, YAMPT, YANPT, YABPH, YAQPH, YAQTH, YAJPH,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           XIRI, XIR2, CSIR1, CSIR2, SNIR1, XIR1SQ, R2SQ, R0, BESQ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              = XIR1*(YDØT(I+5)-YPRED(I+6))+YPRED(I+7)*(XI*SAVY(3)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    (X1*XFZEL1+X2*XFZEL2))-R1*SN1RØ*(YAØPH*(X1*SAVY(1)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      XNUTP, XNUPT, XC11, XC22, XC15, XD33, XD22, XD21, XD12,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  M, I, SITIN, SITBUT, SIPIN, SIPBUT, TPTIN, TPTBUT,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YPRED(I+7)+YPRED(I+4)*(CS1R1-CN1R0)+XN*YPRED(I+5)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       YAMPT#SNIR@/XK33)+R1#YA@PH#(X1#SAVY(3)+X2#SAVY(6))
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   RØSQ, XNSQ, BETA, RI, RZ, SI, RIDØT, RISQ,
XNTTH, XNTTH, XNTTH, XMTPH, XFTHLD, XFPHLD, XFZELD,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        XMTHLD,XMPHLD,ETHET(2),EPHI(2),XGPT(2),ALPHTH(2),ALPHPH(2),
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             XIRB, XIRBSQ, XISNRB, XICSRB, CNIRB, SNIRB, CSIRB,
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                               "SN, CS, SNSQ, CSSQ, TAN, SEC, CN, X1CS, X1 SN, TN,
                                                                                                                                                                                   COMMON STORY(16), XMAT(110,10), STD(10), SADUS(30), RADUS(30)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 (-1.0/((RB/XD33)+(SNSQ*X1RB/XK33)))*(-2.0*XN*
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                                                                                                                                                                                                                       GØMMØN TADUS(30),UADUS(30),SAVTIC(900)
CØMMØN XN,TEFREE,TIC,PHI,STØP,RESTØP,RTICK,GI,XNL(2),NH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               K2#SAVY(4))-YANPT#(X1#SAVY(3)+X2#SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GØ TØ (151,152,153),IGEØM
EQUATIØNS FØR SHELLS ØF REVØLUTIØN ( PHI CØØRDINATE )
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 XK33+SN#YABPH#(X1#SAVY(3)+X2#SAVY(6)))
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                                                                                         INTEGER XN1,XN
DØUBLE PRECISION SAVIIC,TIC,PHI,STØP,RESTØP,RTICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   XN#YPRED(I+6)#XIRB-YPRED(I+4)#SNIRB
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -YPRED(1+7)*(X1*SAVY(2)+X2*SAVY(5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XK11, XK12, XK21, XK22, XK33, XD11,
                                                                                                                                                                                                                                                                                                                                                                                                                   YPRED(16), YDØT(16), YASAVE(16),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             HE FOLLOWING EQUATIONS ARE THE -THICK- SET
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EQUIVALENCE (XNL(1),X1), (XNL(2),X2)
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F(ISTTAB.EQ.1) GØ TØ 7786
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                                                           INTEGER SAVJTC, SAVSTP, 0, THICK
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                                                                                                                                                  DAUBLE PRECISION YPRED
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       )+YPRED(I+5)#CS-YPRED(I+6)+SN)+K*(XNUPT*XNTPH-XNTTH)
YAMTH=XNUPT*YPRED(I+3)-(I.0/S)*XICS*(XDII-XNUPT**2*XD22)*((I.0/S)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 YPRED(1+4)*SN/S+XN*YPRED(1+5)*TN/S+2.0*XN*YPRED(1+6)/S+YPRED
                                                                             -R1*((EPSITH+EPSIPH)*(X1*XFPHL1+X2*XFPHL2)-YPRED(I+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 YANTH=XNUPT+YPRED(I+1)+(XK11-XNUPT++2+XK22)+(X1CS/S)+(XN+YPRED(I+4
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 =-2.0#YPRED(I)/S+XN#YANTH#XICS/S-XN#YAMTH#SN#XICS##2/S##2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YAMTH=XNUPT*YPRED[1+3)-[X1RØ*(XD11-XNUPT**2*XD22))*(X1RØ*(XN*YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                AN/S+(YABPH+(X1+SAVY(1)+X2+SAVY(4))-YANPT+(X1+SAVY(3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YANTH=XNUPT*YPRED(I+1)+(XK11-XNUPT**2*XK22)*(X1RØ*(XN*YPRED(I+4)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YDØT(1+3)= YAMTH/S-YPRED(1+3)/S-2.0*XN*YAMPT/(S*CS)+YAJPH+XMTHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YAMPT=(-].O/({S#CS/XD33)+(SN#TN/(XK33#S)))}*(-2.0#XN#YPRED(I+7)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             -YPRED(I+1)/S+YANTH/S-XN*YPRED(I)/(S*CS)-XN*YAMPT*SN/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (S**2*CS**2)-K*XFPHLD-(EPSITH+EPSIPH)*(X1*XFPHL1+X2*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              +YAMPT*TAN/S*#2-K*(XFTHLD+XMPHLD*TAN/S)-(YDØT(I+4)#
                                                                                                                                                                                                                                                                                                               RI#(YAMTH#CSIRB-YPRED(I+3)*CSIRB-2.0*XN*YAMPT*XIRB+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (X1*XFPHL1+X2*XFPHL2)-X1CS/S*XN*(YANPT*(X1*SAVY(3)+
                                                                                                                                                                                                                            XF2EL]+X2*XF2EL2)+YPRED(]+7)*(X]*XFPHL]+X2*XFPHL2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YDØT(I+4)=(1.0/S)*(YPRED(I+4)+XN*YPRED(I+5)*X1CS+YAMPT*TN/XK33)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |X1*XFPHL1+X2*XFPHL2)+YA0PH*(X1*XFZEL1+X2*XFZEL2))-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           (1.0/(XK22-XNUTP**2*XK11))*(YPRED(I+1)-XNUTP*YANTH+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -2.0*XN*YAMPT/(S**2*CS)+K*(XN*XMPHLD*X1CS/S-XFZELD)
                                                     YAMPT*(SN*X1RØ+X1R1))+YPRED(1+2)*X1R1)-R1*K*XFPHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (EPSITH+EPSIPH)*(X]*XFZEL]+X2*XFZEL2)-YPRED(I+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             YDØT(I+7)=(I.O/(XD22-XNUTP**2*XDII))*(-YPRED(I+3)+XNUTP*YAMTH-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      K*(XNTPH-XNUTP*XNTTH))-YPRED(I+7)*(X1*SAVY(3)+X2*
                                                                                                                                                                                                                                                       -R1+X1R8+XN+(YANPT+(X1+SAVY(3)+X2+SAVY(61)-YABPH+
                                                                                                                                                                                                                                                                                                                                                                                                 RI*(1.0/(XD22-XNUIP**2*XD11))*(-YPRED(I+3)+XNUTP*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XICS*(XN*YPRED(I+4)*SN-XNSQ*YPRED(I+6))+YPRED(I+7)*CS)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  = -YPRED(I+2)/S-YANTH*TAN/S+XNSQ*YAMTH/(S**2*CS**2)
                                                                                                                                          R1*(-YPRED(1+2)*6S1RB-YANTH*SN1RB-YPRED(1+1)*X1R1
                                                                                                                                                                                                  (XN*XMPHLD*X1RB-XFZELD)-R1*((EPSITH+EPSIPH)*(X1*
                                                                                                                                                                     +XNSQ*YAMTH*X1RBSQ-2.0*XN*YAMPT*CS*X1RBSQ}+R1*K*
                          R1#(CS1RB#(YANTH-YPRED(1+1))-XN*X1RB#(YPRED(1)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                = YDØI(I+5)+YPRED(I+7)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            (,1) +SN/XK33+SN*YA@PH*(X1*SAVY(3)+X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      = YPRED(I+2)-YPRED(I+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (1.0/(S*CS))*(XN*YPRED(I+4)+CS*YPRED(I+5)-SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      +YPRED(1)/XK33+YAØPH*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                X2*SAVY(6))-YABPH*(X1*SAVY(1)+X2*SAVY(4)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XFPHL2)+YPRED(I+7)*(X]*XFZEL]+X2*XFZEL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         # XN*YPRED(I+6)*XICS/S-YPRED(I+4)*TAN/S
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      -YPRED( I+7) # (X1 *SAVY (2) +X2 *SAVY (5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    YPRED(I+6)))+K*(XNUP.T*XNTPH-XNTH)
                                                                                                                                                                                                                                                                                                                                                                       RI*(YPRED(I+7)-YPRED(I+5)*XIRI)
                                                                                                                                                                                                                                                                                                                                                                                                                            YAMTH-K*(XMTPH-XNUTP*XMTTH))
                                                                                                                                                                                                                                                                                    (XI*SAVY(1)+X2*SAVY(4)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       K*(XMTPH-XNUTP*XMTTH))
                                                                                                               (X1*XFZEL1+X2*XFZEL2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 K*(XMTTH-XNUPT*XMTPH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              = YPRED(I)+YAMPT*TAN/S
                                                                                                                                                                                                                                                                                                                                          YAJPH+K*XMTHLD]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                +X2 * SAVY (6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YPRED(I+6))
X2*SAVY (6)
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                                                                                                                                                                                                                                                                                                               K2+XF2EL2))-X1R8+(YABPH+(X1+SAVY(1)+X2+SAVY(4))-YANPT+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            YPRED(1+7)*(X1*XFPHL1+X2*XFPHL2)-X1RØ*XN*(YANPT*
(X1*SAVY(3)+X2*SAVY(6))-YAØPH*(X1*SAVY(1)+X2*SAVY(4)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      (XK22+XC22**2/X022)))*(XN*YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              6)*SN)-(XC11+XK12*XC22*XD21/XD22*(1.0/(XK22+XC22**2/XD22)))*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       (XIR0**2*(XN*YPRED(I+4)*SN-XN**2*YPRED(I+6))+YPRED(I+7)*CS*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      x1R0+XD12*XK21*X1R0*(XC22/(XC22**2+XK22*XD22)))*(XN*YPRED(
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     RI*(YPRED(I+4)*CS1R0+XN*YPRED(I+5)*X1R0+YPRED(I)/XK33+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  (XC22/XD22)*(YPRED(1+3)+K*XMTPH))-K*XNTTH+(X1RØ*XK11-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -K*XMTTH+XD12*(XK22/(XC22*#2+XK22*XD22)) #(YPRED(I+3)+
                                                   AMPT=(-1.0/((RØ/XD33)+(X1RØ/XK33)))*(-2.0*XN*YPRED(1+7)+XN*X1RØ*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              XIR0SQ-YAMPT*CSIR0*(XIR1-SNIR0))-R1*K*(XFTHLD+XMPHLD*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            -XD12*(XC22/(XC22**2+XK22*XD22))*(YPRED(I+1)+K*XNTPH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YDØT(I+7) = (1.0/(XD22-XNUTP**2*XDII))*(-YPRED(I+3)+XNUTP*YAMTH+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          EPSIPH) # (X1 *XFPHL1+X2 *XFPHL2) +YPRED(I+7) # (X1 *XFZEL1+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XC22*#2+XK22*XD22))#(XIRBSQ#(XN*YPRED(1+4)#SN-XNSQ*YPRED
                                                                                                                                                                                                                                                           XN*YANTH*XIR@-XN*YAMTH*XIR@SQ-K*(XFTHLD+XMPHLD*XIR@)
-{YD@T{[1+4]*{X1*XFPHL1+X2*XFPHL2}+YA@PH*(X1*XFZEL1+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              1+4)+YPRED(1+5)*CS-YPRED(1+6)*SN)+(XD11-XD12*XK22*XD21/(
                                                                                                                                                                                                                                                                                                                                                                  (1.0/(XK22-XNUTP**2*XK11)) * (YPRED(1+1)-XNUTP*YANTH+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               -XN+X1RØ+YPRED(I)-XN+YAMPT+X1RØSQ-K+XFPHLD-(EPSITH+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XK12*(1.0/(XK22+XC22**2/XD22))*(YPRED(1+1)+K*XNTPH+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PRED([+7)+YPRED([+4)*(CSIR1-CNIR0)+XN*YPRED([+5)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                YAMPT#SN1RØ/XK33)+R1 #YAØPH#(X1#SAVY(3)+X2#SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      RI*(-2.0*YPRED(I)*CSIRO+XN*YANTH*XIRO-XN*YAMTH*SN*
                                                                                                                                                                                                                                                                                                                                                                                           K+(XNTPH-XNUTP+XNTTH))-YPRED(I+7)+(X1+SAVY(3)+X2+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SN1R0)-(YD01(I+4)+(X1*XFPHL1+X2*XFPHL2)+R1*YA0PH*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |SNIR@+XIR1)+2.0*XN*YPRED(I+6)*CS1R@+YPRED(I)*SN/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -YANTH#X1RØ+XNSQ#YAMTH#X1RØSQ+K#(XN#XMPHLD#X1RØ-
                                                                           rpred(1+5)+ypred(1)/xk33+ya0pH*(x1*Savy(3)+x2*
                                                                                                                                                                                                          YDBT(I+4)=XN*YPRED(I+5)*X1RB+YPRED(I)/XK33+YAMPT*X1RB/XK33
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      XFZELD)-(EPSITH+EPSIPH)*(X1*XFZEL1+X2*XFZEL2)-
(I+4)-XNSQ*YPRED(I+6)))+K*(XNUPT*XMTPH-XMTTH)
                                                                                                                               YPRED(1+2)-YPRED(1+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  (-1.0/((R0/XD33)+(SNSQ*X1R0/XK33)))*(-2.0*XN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       YPRED(1+2)-YPRED(1+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YDØT(1+5)+YPRED(1+7)*(X1*SAVY(3)+X2*SAVY(6))
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              XK33+SN*YABPH*(X1*SAVY(3)+X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    -YPRED(1+7)*(X1*SAVY(2)+X2*SAVY(5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XN*YPRED(1+6)*X1RØ-YPRED(1+4)*SN1RØ
                                                                                                                                                       -YPRED(1+7)*(X1*SAVY(2)+X2*SAVY(5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 -2.0*XN*YAMPT*X1RØ+YAJPH+K*XMTHLD
                             X1RØ*(XN*YPRED(I+6)-YPRED(I+4))
                                                                                                                                                                                                                                                                                                                                                                                                                                              X1RØ*(XN*YPRED(I+4)-YPRED(I+6))
                                                                                                                                                                                                                                     +YABPH*(X1*SAVY(3)+X2*SAVY(6))
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             K*(XNUTP*XMTTH-XMTPH))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EQUATIONS FOR SHELLS OF REVOLUTION
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             YPRED(I)+YAMPT*SNIRØ
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                                                                                                                                                                                = YPRED(I)+YAMPT#X1RØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                7786 GØ TØ (4771,4772,4773), [GEØM
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                                                                                                                                                                                                                                                                                                                                                                                                                        SAVY (6))
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  +(XK22/(XC22**2+XK22*XD22))*(YPRED(I+3)+K*XMTPH)-(XK22*
XD21/(XC22**2+XK22*XD22))*(X1RBSQ*(XN*YPRED(I+4)*SN-XNSQ
                                                                                                                                                       YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)*SN)-(XC22*XD21/XD22
                                                                                                                                                                                                                                                                                                                                                                                                          -R1*((EPSITH+EPSIPH)*(X1*XFPHL1+X2*XFPHL2)-YPRED(1+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |XC22/XD22) * (YPRED(1+3) + K*XMTPH)) - K*XNTT H+(1.0/(CS*S))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            PRED(1+6)*SN)-(XC11+(XK12*XD21*XC22/XD22)*(1.0/(XK22+XC22*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 XD21/(XC22**2+XK22*XD22))*((1.0/(S*CS)**2)*(XN*YPRED(I+4)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         YPRED(I+4)*SN/S+XN*YPRED(I+5)*TN/S+2.0*XN*YPRED(I+6)/S+YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   -YPRED(1+7)*(X1*SAVY(3)+X2*SAVY(6))+(1.0/(XK22+XC22**2
                                                             R1 # (YPRED (I+6) # XIRI - YPRED (I+7) # (XI # SAVY (3) + X2 # SAVY (6))
                                                                                                                                                                                        )*(X1RBSQ*(XN*YPRED(I+4)*SN-XNSQ*YPRED(I+6))+YPRED(I+7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            *2/XD22)))*((1.0/(S**2*CS**2))*(XN*YPRED(1+4)*SN-XNSQ*YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           =-2.0*YPRED(I)/S+XN*YANTH*XICS/S-XN*YAMTH*SN*XICS**2/S**2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      IN/S#(YABPH#(X1#SAVY(1)+X2#SAVY(4))-YANPT#(X1#SAVY(3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   -K*XMTTH+XD12*(XK22/(XC22**2+XK22*XD22)) *(YPRED(I+3)+
                                                                                          1.0/(XK22+XC22**2/XD22))*(YPRED(I+1)+K*XNTPH+(XC22/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         -XD12*(XC22/(XC22**2+XK22*XD22))*(YPRED(I+1)+K*XNTPH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    (S#CS)+XD12*XK21/(S*CS))*(XC22/(XC22**2+XK22*XD22))*(XN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    YAMPT=(-1.0/((S*CS/XD33)+(SN*TN/(XK33*S))))*(-2.0+XN*YPRED(1+7)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    R1*((-XC22/(XC22**2+XK22*XD22))*(YPRED(I+1)+K*XNTPH-
.1+X2*XFZEL2))-R1*SN1RØ*(YAØPH*(X1*SAVY(1)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XFZEL1+X2+XFZEL2)+YPRED(I+7)+(X1+XFPHL1+X2+XFPHL2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YAMPT#TAN/S##2-K#(XFTHLD+XMPHLD#TAN/S)-(YDØT(I+4)#
                                                                                                                                                                                                                                                                               XIR1#(YDØT(I+5)-YPRED(I+6))+YPRED(I+7)*(X1*SAVY(3)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             R1*(YAMTH*CS1R8-YPRED(I+3)*CS1R8-2.0*xN*YAMPT*X1R8+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         X1*XFPHL1+X2*XFPHL2)+YAØPH*(X1*XFZEL1+X2*XFZEL2))-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          1.0/(XK22+XC22**2/XD22))*(YPRED(I+1)+K*XNTPH+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 YDØT(I+4)=(I.O/S)=(YPRED(I+4)+XN*YPRED(I+5)*X1CS+YAMPT*TN/XK33)
                                                                                                                                                                                                                                                                                                                                                                       /AMPT*(SN*X1RB+X1R1))+YPRED(I+2)*X1R1)-R1*K*XFPHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              +XC22**2/XD22)))*(XN*YPRED(I+4)+YPRED(I+5)*CS-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  -R1 *X1R8 * XN * (YANPT * (X1 * SAVY (3) + X2 * SAVY (6)) - YABPH *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       RI*(-YPRED(I+2)*CSIRØ-YANTH*SNIRØ-YPRED(I+1)*XIRI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       +XNSQ*YAMTH*X1RBSQ-2.0*XN*YAMPT*CS*X1RBSQ)+R1*K*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XN*XMPHLD*X1RØ-XFZELD)-R1*((EPSITH+EPSIPH)*(X1*
                                                                                                                                                                                                                                                  = XIRØ*(XN*YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)*SN)
                                                                                                                                                                                                                                                                                                                                             R1*(CS1R0*(YANTH-YPRED(I+1))-XN*X1R0*(YPRED(I)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    RØ)*(XN*YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)*SN))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      [I]#SN/XK33+SN*YABPH*(XI*SAVY(3)+X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         = YPRED(I+2)-YPRED(I+1)*(X1*SAVY(3)+X2*SAVY(6))
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                                                                                                                       (022) # (YPRED (1+3) + K + XMTPH) - XK21 + X1R8 + (XN +
                             (4))-YANPT*(X1*SAVY(3)+X2*SAVY(6))
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                                                                                                                                                                                                                                                                                                                                                                                                                                          YPRED(I)+YAMPT*TAN/S
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            /(XC22442+XK224XD22))#((1.0/(S#CS)442)#(XN#YPRED(I+4)#SN
                                                I+5)*CS-YPRED(I+6)*SN)-(XC22*XD21/XD22)*((1,0/(S**2*CS**
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                (XC22/XD22) + (YPRED(I+3)+K*XMTPH))-K*XNTTH+(X1RØ*(XK11-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      X2*XFZEL2)]-X1RB*(YABPH*(X1*SAVY(1)+X2*SAVY(4))-YANPT*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         = -YPRED(1+7) + (X1 + SAVY(3) + X2 + SAVY(6)) + (1.0 / (XK22 + XC22 * * 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              (1+4)~YPRED(1+6))+(XD11-XD12*XK22*XD21/(XC22*#2+XK22*XD22)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YDØT(I+7) = -(XC22/(XC22**2+XK22*XD22)) * (YPRED(I+1) + K * XNTPH - XK21 *
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         +(XK22/(XC22*#2+XK22#XD22))#(YPRED(I+3)+K#XMTPH)-(XK22#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XK12*XC22*XD21/XD22)*(1.0/(XK22+XC22**2/XD22)))*(X1RB**2*(
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XIR0+XD12#XK21#X1R0#(XC22/(XC22##2+XK22#XD22)))#(XN#YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               YAMPT=(-1.0/((RØ/XD33)+(X1RØ/XK33)))+(-2.0+XN*YPRED(1+7)+XN*X1RØ*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     = -x012+(xC22/(xC22+2+xK22+xD22))+(YPRED(I+1)+K+xNTPH)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               -K*XMTTH+XD12*(XK22/(XC22**2+XK22*XD22))*(YPRED(I+3)+
                                                                                                                                                                                                                                                                                                                                                                                                             YD01(1+3)= YAMTH/S-YPRED(1+3)/S-2.0*XN*YAMPT/(S*CS)+YAJPH+XMTHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              XN*YANTH$X1RB-XN*YAMTH$X1RBSQ-K*(XFTHLD+XMPHLD*X1RB)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            EPSIPH) * (X1 * XFPHL 1 + X2 * XFPHL 2 ) + YPRED (1+7) * (X1 * XFZEL 1 +
                                                                                                                                                                                                                 (S*#2#CS##2)-K#XFPHLD-(EPSITH+EPSIPH)#(X1#XFPHL1+X2*
                                                                                                                                                                                       -YPRED(I+1)/S+YANTH/S-XN*YPRED(I)/(S#CS)-XN*YAMPT*SN/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          = XK12*(1.0/(XK22+XC22**2/XD22))*(YPRED(1+1)+K*XNTPH+
/X022)) *(YPRED([+1]+K*XNTPH+(XC22/X022)*(YPRED([+3)
                                                                                                                                                                                                                                                                                                                                                        (XI * XFP HL I + X2 * XFP HL 2 ) - X I CS / S * XN * (Y A N PT * (XI * S A V Y (3) +
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          -(YDØT(1+4)*(X1*XFPHL1+X2*XFPHL2)+YAØPH*(X1*XFZEL1+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  /XD22))*(YPRED(I+1)+K*XNTPH+(XC22/XD22)*(YPRED(I+3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   -XN*X1R@*YPRED(1)-XN*YAMPT*X1RBSQ-K*XFPHLD-(EPSITH+
                                                                               2))*(XN*YPRED[1+4)*SN-XNSQ*YPRED(1+6))+YPRED(1+7)/S))
                                                                                                                                                                                                                                                                                                     -2.0*XN*YAMPT/(S**2*CS)+K*(XN*XMPHLD*XICS/S-XFZELD)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XK22+XC22**2/XD22))))*(XN*YPRED(I+4)-YPRED(I+6))-(XC1I+(
                                                                                                                                                                                                                                                                                                                              -(EPSITH+EPSIPH)*(X1*XF2EL1+X2*XF2EL2)-YPRED(1+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              (I+6))-(XC22*XD21/XD22)*(X1RBSQ*(XN*(YPRED(I+4)-XN*YPRE
                                                                                                                                                                                                                                                                           = -YPRED(1+2)/S-YANTH*TAN/S+XNSQ*YAMTH/(S*#2#CS*#2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YOUT(1+4)=XN*YPRED(1+5)*X1R0+YPRED(1)/XK33+YAMPT*X1R0/XK33
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         /PRED(1+5)+YPRED(1)/XK33+YABPH*(X1*SAVY(3)+X2*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             YPRED(1+4)+YPRED(1+5)*CS-YPRED(1+6)*SN)/IS*CS))
                                                                                                           = (1.0/(S*CS))*(XN*YPRED(1+4)+CS*YPRED(1+5)-SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              = YPRED(I+2)-YPRED(I+1)*(X1*SAVY(3)+X2*SAVY(6))
                              +K#XMIPH)-[XK21/[S#CS])#(XN#YPRED(I+4)+YPRED
                                                                                                                                                                = YDØI([+5)+YPRED([+7]) (X] *SAVY(3)+X2 *SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         YDØT(I+5)+YPRED(I+7)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              +K+XMTPH)-(XK21+X1RD)+(XN+YPRED(I+4)-YPRED
                                                                                                                                                                                                                                                                                                                                                                                    X2#SAVY(6))-YABPH#(X1#SAVY(1)+X2#SAVY(4)))
                                                                                                                                                                                                                                               XFPHL2)+YPRED(I+7)*(X1*XFZEL1+X2*XFZEL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            ) # ( X 1R Ø S Q * ( XN * Y P R E D ( I + 4 ) - X N S Q * Y P R E D ( I + 6 ) ) )
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        -YPRED(1+7) + (X1 *SAVY (2) +X2 *SAVY (5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         +YABPH#(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                X1RØ*(XN*YPRED(1+4)-YPRED(1+6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     -XN**2*YPRED(I+6)]+YPRED(I+7)/S)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      = X1R0*(XN*YPRED(1+6)-YPRED(1+4))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XN*YPRED (1+4)-XNSQ*YPRED (1+6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (X1 * SAVY(3) + X2 * SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    YPRED(I)+YAMPT#X1RØ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XK12*XK21*(1.0/(
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             K*XMTPH)+(XC11*
                                                                                                                                    PRE0(I+6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                EQUATIONS FOR CYLINDER
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      C(((9+1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   YD0T(1+6)=YPRED(1+7):
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     SAVY (6) )
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                                                                                                                                                                                            *DØT(I+1)=
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 GB TB 9005
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                                                                                                                                                                                                                                                                           YDØT (1+2)
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                              XFZELD)-(EPSITH+EPSIPH)*(XI*XFZELI+X2*XFZEL2)-
YPRED(I+7)*(XI*XFPHL1+X2*XFPHL2)-XIRØ*XN*(YANPT*
(XI*SAVY(3)+X2*SAVY(6))-YAØPH*(XI*SAVY(I)+X2*SAVY(4)))
                                                                                                                                                            XN&YPRED(I+4)-YPRED(I+6)))+(XK22/(XC22**2+XK22**D22))*(
YPRED(I+3)+K*XMTPH)-(XK22*XD21/(XC22**2+XK22*XD22))*(
X1R0SQ*(XN*YPRED(I+4)-XNSQ*YPRED(I+6)))
                                                                                                            YOUT(1+6)=YPRED(1+7)
YD0T(1+7) = -(XC22/(XC22**2+XK22**D22))*(YPRED(1+1)+K*XNIPH-XK21*
             = -YANTH#XIRØ+XNSQ#YAMTH#XIRØSQ+K#(XN#XMPHLD#XIRØ-
                                                                                       YDØT(1+3) = -2.0*XN*YAMPT*XIRØ+YAJPH+K*XMTHLD
                                                                                                                                                                                                                                                                                                     YASAVE(IY+4)=YAØPH
YASAVE(IY+7) = YAJPH
RETURN
END
 X2*XF ZEL2)
                                                                                                                                                XIRØ*(
                                                                                                                                                                                                                                         YASAVE(IY) = YANTH
                                                                                                                                                                                                                                                            YASAVE(IY+1)=YAMTH
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YDØT(1+2) =
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XC15+(XK12+XD22+XK22+XD12)-XK12+XD12+XC22)/(XK22+XD22+XC22*))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    ((XK33*XD33-XC16**2)*X1R@*(-2.0*XN*YPRED(I+7)+YPRED(I+4)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      = (YPRED(I+3)+K*XMTPH)*(XC15*XC22+XK22*XD12)/(XK22*XD22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XC22*XC22) + (YPRED(I+1) + K*XNTPH) * (XD22*XC15-XD12*XC22) / (XD22*XK22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 RØ)-XC16)))
                                                                                                                                                                                                                                                                                                                                                               CBMMBN NST(30),NKL(30),NXMAT(20),SAVJTC(30),SAVSTP(30),JRTIC(30)
CBMMBN JRSTBP(30),NREG,NMPT,NRC,NSC,NIX,IERRBR,KGEBH,IGEBH,ISTTAB
CBMMBN KELVIN,IBEGIN,NPRBB,NSEG,NERRBR,Q,THICK,NBJS,NLINKS,NLCASE
CBMMBN NTSKL,NZ,NBCTTLINPUT,NTRKL,NPASS,XNI,KBC,NRINGS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 1+6)*CS*X1RB)+YABPH*SN*(XI*SAVY(3)+X2*SAVY(6))+YPRED(I)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XD22))/(XC22*XC22+XK22*XD22))+X1RØ*(XN*YPRED(I+4)+YPRED(I+5)*CS-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      CBHMBN /LASTEQ/ YPRED(16),YDBT(16),YASAVE(16),
YANTH,YAMTH,YAMPT,YANPT,YABPH,YAQPH,YAQPH,YAJPH,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    M.I.SITIN, SITØUT, SIPIN, SIPØUT, TPTIN, TPTØUT, ZBRIN, ZBRIN, ZBRØUT, SCRIPA, SCRIPI, SIFIN, SIFØUT, TZEPH, TZETH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       YPRED(I+6)*SN)*(XK11+(XC15*(XC15*XK22-2.0*XK12*XC22)-XK12*XK12*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YPRED(I+6)*SN)*(XC11+(XD12*XC22*XK12~XC15*(XC15*XC22+XD12*XK22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   = R1*(YPRED(1+4)*CS*X1RB+YABPH*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        XIRI, XIRZ, CSIRI, CSIRZ, SNIRI, XIRISQ, R2SQ, RØ, BESQ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           CS*XIRI-CNIRØ)+XN*YPRED(I+5)*(XIRI+SNIRØ)+2.0*XN*YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              X1R@*YPRED(1+7)*CS)*(XD11-(XD12*XD12*XK22+XC15*(2.0*XC22*XD12-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        XC16**2/XD33))*(YPRED(I)+YAMPT*(SN*X1RB-XC16/XD33)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          XNUTP, XNUPT, XC11, XC22, XC15, XD33, XD22, XD21, XD12,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  RI*(-2.0*YPRED(I)*CSIRB+XN*YANTH*XIRB-XN*YAMTH*SN*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XC22*#2)-K#XMTTH+(XIRBSQ#(XN*YPRED(I+4)#SN-XNSQ#YPRED(I+6))+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      XC22**2)-K*XNTTH+(XK12*XC22-XK22*XC15)+(YPRED(1+3)+K*XMTPH)/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  XNITH, XNTPH, XMTTH, XMTPH, XFTHLD, XFPHLD, XFZELD,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XMTHLD, XMPHLD, ETHET (2), EPHI (2), XGPT (2), ALPHTH (2), ALPHPH (2),
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              XD22)/(XK22*XD22+XC22*XC22))+(XIRØSQ*(XN*YPRED(I+4)*SN-XNSQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 XIRB, XIRBSQ, XISNRB, XICSRB, CNIRB, SNIRB, CSIRB,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       S.SN,CS, SNSQ,CSSQ,TAN,SEC,CN,X1CS,X1SN,TN,
                                                                                                                                                                                                                                COMMON STORY(16), XMAT(110,10), STD(10), SADUS(30), RADUS(30)
COMMON TADUS(30), UADUS(30), SAVT(C(900)
COMMON XN, TEFREE, TIC, PHI, STOP, RESTOP, RTICK, G1, XNL(2), NH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             {XC22*XC22+XK22*XD22)+X1RB*(XN*YPRED(I+4)+YPRED(I+5)*CS-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        *YPRED(1+6))+X1RØ*YPRED(I+7)*CS)*(-XC11+(XC15*XC15*XC22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   YPRED(1+2)-YPRED(1+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     EQUATIONS FOR SHELLS OF REVOLUTION ( PHI COORDINATE )
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          = (1.0/(XC16*SN*X1RB-XK33-SN*X1RB*(XD33*SN/(
* RBUTINE **D20 / ** ABACUS UPDATED 07/07/72 ...
SUBRBUTINE BDE2(XFPHL), XFZEL1, XFPHL2, XFZEL2)
                                                                                                                       INTEGER XN1,XN
Døuble precisiøn savtic,Tic,PHI,STØP,RestøP,Rtick
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     , XNPHI, BETTA, ZETTA, SAVY(8), XC16
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       = XN*YPRED(1+6) *X1R0-YPRED(1+4) *SN1R0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             -YPRED(I+7) # (X1 *SAVY(2) +X2 *SAVY(5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             XK11,XK12,XK21,XK22,XK33,XD11,
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              HE FULLOWING EQUATIONS ARE THE -RWAF- SET
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       RØSQ, XNSQ, BETA, RI, R2, SI, RIDØT, RISQ,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        EQUIVALENCE (XNL(1),X1), (XNL(2),X2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            XD22*XK1211/(XC22*XC22+XK22*XD221)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 -
                                                                                 INTEGER SAVJTC, SAVSTP, Q, THICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GB TB (7341,7342,7343), IGEBM
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                                                                                                                                                                                                 DØUBLE PRECISION YPRED
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         YAMPT*(SN*X1RØ+X1R1))+YPRED(1+2)*X1R1)-R1*K*XFPHLD
-R1*((EPSITH+EPSIPH)*(X1*XFPHL1+X2*XFPHL2)-YPRED(1+7)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      1*(XN&YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)*SN)*(XK12*XC22-XK22*XC15)
2-(XIRØSQ*(XN*YPRED(I+4)*SN-XNSQ*YPRED(I+6)·)+XIRØ*YPRED(I+7)*CS)*
3(XC15*XC22+XK22*XDJ2))/(XC22*2+XK22*XD22)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 YANTH = (YPRED[I+1)+K*XNTPH)*(XC15*XC22+XD22*XX12)/(XK22*XD22+
1 XC22**2)-K*XNTTH+(XK12*XC22-XK22*XC15)*(YPRED[I+3)+K*XHTPH)/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     = (YPRED(I+3)+K*XMTPH)*(XC15*XC22+XK22*XD12)/(XK22*XD22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       XC22442)-K4XMTTH+(1.0/(S*S4CSSQ)+(-XNSQ4VPRED(I+6)+XN4YPRED(I+4)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    =((XC16*TAN/S-XK33-(TAN/S)*(XD33*TAN/S-XC16))**(-1))*((XK33*
                                                                                                                                                                                                                                                                                 YPRED(1+6))+X1R8*YPRED(1+7)*CS)*(XC22*XD12-XC15*XD22))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 6 XC15+(XK12+XD22+XK22+XD12)-XK12+XD12+XC22)/(XK22+XD22+XC22))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SN)+YPRED(I+7)/S)*(XD11-(XD12*XD12*XK22+XC15*(2.0*XC22*XD12-XC15*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          =-2.0*YPRED(1)/S+XN*YANTH*XICS/S-XN*YAMTH*SN*X1CS**2/S**2
KIROSQ-YAMPT#CSIRB#(XIRI-SNIRB))-R1#K#(XFTHLD+XMPHLD*
                                                                                                                                                                           (XD22*(YPRED(I+1)+K*XNTPH)+XC22*(YPRED(I+3)+K*XMTPH)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    XD33-XC16##2)#(1.0/(S#CS))#(-2.0#XN#YPRED(1+7)-YPRED(1+4)#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      1 XC22##2}+{YPRED(1+1)+K#XNTPH)#(XD22#XC15-XD12#XC22)/(XD22#XK22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YPRED(1+6)*SN)*(XC11+(XD12*XC22*XK12-XC15*(XC15*XC22+XD12*XK22+
                                                                                                                                             YPRED(1+6)-R1*YPRED(I+7)*(X1*SAVY(3)+X2*SAVY(6))+R1*
                                                              (XI*XFZEL1+X2*XFZEL2))-RI*SNIRØ*(YAØPH*(XI*SAVY(I)+
                                                                                                                                                                                                                                                                                                                                                                                       XIR1 + (YDØT(I+5)-YPRED(I+6))+YPRED(I+7) + (X1 + SAVY(3)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               XF2EL1+X2*XF2EL2)+YPRED(I+7)*(X1*XFPHL1+X2*XFPHL2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         SN/S+XN#YPRED(1+5)#TAN/S+2.0*XN#YPRED(1+6)/S)+YABPH#SN#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           +YAMPT+TAN/S**2-K*(XFTHLD+XMPHLD*TAN/S)-(YDBT(I+4)*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YDØT(1+3) = R1*(YAMTH*CSIRØ-YPRED(1+3)*CSIRØ-2.0*XN*YAMPT#XIRØ+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   (XC22*XC22+XK22*XD22)+(XN*YPRED(I+4)+YPRED(I+5)*CS-YPRED(I+6)
                                                                                                                                                                                                                                            |XK12#XD22+XC15#XC22)-(X1RBSQ*(XN*YPRED(1+4)-XNSQ*
                                                                                                                                                                                                               XIRB#(XN*YPRED(1+4)+YPRED(1+5)#CS-YPRED(1+6)#SN)*
                                SNIRB)-(YDBT(I+4)*(X1*XFPHL1+X2*XFPHL2)+R1+YABPH*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       YOBT(1+6) = R1*(YPRED(1+7)-YPRED(1+5)*X1R1)
YDBT(1+7) = R1*(XK22*(YPRED(1+3)+K*XMTPH)-XC22*(YPRED(1+1)+K*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    *SN)/(S*CS)*(XK11+(XC15*(XC15*XK22-2.0*XK12*XC22)-XK12*XK12*
XD22)/(XK22*XD22+XC22*XC22))+((XN*YPRED(1+4)*SN-XNSQ*
YPRED(1+6))/(S*S*CSQ)+YPRED(1+7)/S)*(-XC11+(XC15*KC15*XC22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                -R1#X1RB#XN#(YANPT#(X1#SAVY(3)+X2#SAVY(6))-YABPH#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         RI#(-YPRED(I+2)*CSIRB-YANTH*SNIRB-YPRED(I+1)*XIR1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          +XNSQ+YAMTH*X1RBSQ-2.0*XN*YAMPT*CS*X1RBSQ)+R1*K*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           (XN*XMPHLD*X1RB-XFZELD)-R1*((EPSITH+EPSIPH)*(X1*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             YPRED(1+4)/S+YABPH#(X1#SAVY(3)+X2#SAVY(6))+XN#
                                                                                                                                                                                                                                                                                                                                                      X1RB#(XN#YPRED(I+4)+YPRED(I+5)#CS-YPRED(I+6)#SN)
                                                                                                                                                                                                                                                                                                                                                                                                                                                     R1*(CS1R0*(YANTH-YPRED(I+1))-XN*X1R0*(YPRED(I)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (X1 + SAVY(3) + X2 + SAVY(6)) + YPRED(1) + (XD33 + TAN/S - XC16))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XD22))/(XC22*XC22+XK22*XD22))+1.0/(S#6S)*(XN*YPRED(I+4)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          = YPRED(1+2)-YPRED(1+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         XD33))*(YPRED(I)+YAMPT*(TAN/S-XC16/XD33))
                                                                                                     K2*SAVY(4))-YANPT*(X1*SAVY(3)+X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   = XN*YPRED(I+6)*X1CS/S-YPRED(I+4)*TAN/S
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    (X1*SAVY(1)+X2*SAVY(4))) ::
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XD22*XK12))/(XC22*XC22+XK22*XD22))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        (X1*XFZEL1+X2*XFZEL2))
                                                                                                                                                                                                                                                                                                                        /(XK22*XD22+XC22**2)
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               = (YPRED(I+3)+K*XMTPH)*(XC15*XC22+XK22*XD12)/(XK22*XD22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           X2*XFZEL2))-X1R0*(YA0PH*(X1*SAVY(I)+X2*SAVY(4))-YANPT*
                              TAN/S*(YABPH*(X1*SAVY(1)+X2*SAVY(4))-YANPT*(X1*SAVY(3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                = (YPKED([+1)+K*XNTPH)*(XC15*XC22+X022*XK12)/(XK22*XD22+
                                                                                        -YPRED(1+7)*(X1*SAVY(3)+X2*SAVY(6))+(XD22*(YPRED(1+1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YD01(1+7) = (XK22*(YPRED(1+3)+K*XMTPH)-XC22*(YPRED(1+1)+K*XNTPH)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              YAMPT=(1/(XC16*X1R0-XK33-X1R0*(XD33*X1R0-XC16)))*((XK33*XD33-XC16
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         1(XN*YPRED(I+4)-YPRED(I+6))*(XK12*XD22+XC15*XC22)-XIRØSQ*(XN*YPRED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        = -YPRED(I+7)*(X1*SAVY(3)+X2*SAVY(6))+(XD22*(YPRED(I+1)
                                                                                                                                                            XD22+XC15*XC22)*(1.0/(S*CS)*(XN*YPRED(1+4)+YPRED(1+5)*
                                                                                                                                                                                                                            YPRED(I+6)+XN*YPRED(I+4)*SN)/(S*S*CSSQ)+YPRED(I+7)/S))
                                                                                                                                                                                                                                                                                                                                                                                        YDØT(I+1) = -YPRED(I+1)/S+YANTH/S-XN*YPRED(I)/(S*CS)-XN*YAMPT*SN/
(S**2*CS*2)-K*XFPHLD-(EPSITH+EPSIPH)*(XI*XFPHL1+X2*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       YOOT(I+3)= YAMTH/S-YPRED(I+3)/S-2.0*XN*YAMPT/(S*CS)+YAJPH+XMTHLD
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 XC22**2)+(YPRED(I+1)+K*XNTPH)*(XD22*XC15-XD12*XC22)/(XD22*XK22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      *#2) #X1RB#(-2.0#XN*YPRED(I+7)+XN#X1RB#YPRED(I+5))+YABPH#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        = XN*YANTH*XIRB-XN*YAMTH*XIRBSQ-K*(XFIHLD+XMPHLD*XIRB)
X1*XFPHL1+X2*XFPHL2)+YABPH*(X1*XFZEL1+X2*XFZEL2))-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (XI *XFPHL 1+X2*XFPHL2 )-X1CS/S*XN* (YANPT* (X1*SAVY (3)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            -(YDØT(1+4)*(X1*XFPHL1+X2*XFPHL2)+YAØPH*(X1*XF2EL1+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         -2.0*XN*YAMP1/(S**2*CS)+K*(XN*XMPHLD*X1CS/S-XF2ELD)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -(EPSITH+EPSIPH)#{X}#XFZEL]+X2#XFZEL2)-YPRED(I+7)#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                YPRED(1+5) #CS-YPRED(1+6) #SN))-(XC15#XC22+XK22#XD12)#
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            = (YABPH*(X]*SAVY(3)+X2*SAVY(6))+XN*YPRED(I+5)/RB)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -YPRED(I+2)/S-YANTH*TAN/S+XNSQ*YAMTH/(S**2*CS**2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    1 XC22**2)-K*XNTTH+(XK12*XC22-XK22*XC15)*(YPRED(I+3)+K*XMTPH)/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YPRED(1+6))*(XK11+(XC15*(XC15*XK22-2.0*XK12*XC22)-XK12*XK12*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            YPRED(1+6))*(XC11+(XD12*XC22*XK12-XC15*(XC15*XC22+XD12*XK22+
                                                                                                                                                                                              CS-YPRED(I+6) #SN))-(XC22 #XD12-XC15 #XD22) #( -XNSQ #
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     XK12*XC22-XK22*XC15)*(1.0/(S*CS)*(XN*YPRED(1+4)+
                                                                                                                                                                                                                                                                                         = (1.0/(S#CS))#(XN#XPRED(I+4)+CS#YPRED(I+5)-SN#"
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  ((-XNSQ*YPRED(I+6)+XN*YPRED(I+4)+SN)/(S*S*CSSQ)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              (X1*SAVY(3)+X2*SAVY(6))+YPRED(1)*(XD33*X1RB-XC16))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XD22)/(XK22*XD22+XC22*XC22))+(XIRBSO*(XN*YPRED(I+4)-XNSQ
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             = YPRED(1+2)-YPRED(1+1)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                             = YDØT(1+5)+YPRED(1+7)*(X1*SAVY(3)+X2*SAVY(6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XC22*#2)-K#XMTTH+X1RDSQ#(XN#YPRED(I+4)-XNSQ#YPRED(I'+6))
                                                                                                                                +K*XNTPH)+XC22*(YPRED(I+3)+K*XMTPH)-(XK12*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        X2*SAVY(6))-YABPH*(X1*SAVY(1)+X2*SAVY(4)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          +K + XNTPH) + XC 22 + (YPRED(1+3) + K + XMTPH) - X1RB +
                                                                                                                                                                                                                                                                                                                                                                                                                                                         XFPHL2)+YPRED(I+7)*(X1*XFZEL1+X2*XFZEL2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XD22))/(XC22*XC22+XK22*XD22))+X1RB+(XN*YPRED(I+4)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 *(XD11-(XD12*XD12*XK22+XC15*(2.0*XC22*XD12-XC15*
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          (1.0/(XK33-XC16*#2/X033))#(YPRED(I)+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           -YPRED( 1+7) + (X1 * SAVY (2) + X2 * SAVY (5))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    YPRED(1+7)/S))/(XK22*XD22+XC22*XC22)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   (XC22*XC22+XK22*XD22)+X1RØ*(XN*YPRED(I+4)-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            = X1R0*(XN*YPRED([+6]-YPRED([+4])
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  *YPRED(I+6)))*(-XC11+(XC15*XC15*XC22+
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             (XI * SAVY(3) + X2 * SAVY(6)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                XD22*XK12))/(XC22*XC22+XK22*XD?2))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         YAMPT # (XIRB-XC16/X033)
                                                                                                                                                                                                                                                           /! XK22*XD22+XC22*XC22)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          = YPRED(I)+YAMPT#XIRØ
                                                                +X2*SAVY(6)))
                                                                                                                                                                                                                                                                                                                              YPRED(1+6))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 EQUATIONS FOR CYLINDER
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       YDØT (I+6)=YPRED(I+7)
                                                                                                  11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           VD@T(1+2) =
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     TØ 9005
                                                                                               YDØT(1+5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            YDØT(I+4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           YDØT([+5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Y.D.ØT(I)
                                                                                                                                                                                                                                                                                                                                                       EPSIPH
                                                                                                                                                                                                                                                                                         EP SI TH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      YANTH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YABPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             YAJPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          YANPT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      7343
```

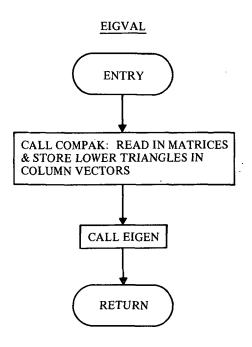
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2101910
                                                                                                                                                                                                                                                                                2101990
                                                                                                                                                                                                                                                                                                      2102000
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                                             2101890
                                                                   2101900
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             2102090
                                                                                                                                                                                                           (X1 * SAVY(3) + X2 * SAVY(6)) - YABPH*(X1 * SAVY(1) + X2 * SAVY(4)))
                                                                                                                                                                                                                                                                                                                     1(XN*YPRED(1+4)-YPRED(1+6))*(XK12*XC22-XK22*XC15)-X1RØSG*(XN*YPRED
2(1+4)-XNSG*YPRED(1+6))*(XC15*XC22+XK22*XD12))/(XC22**2+XK22*XD22)
2 (I+4)-XNSQ*YPRED(I+6))*(XC22*XDI2-XCI5*XD22))/(XK22*XD22+XC22**2)
                                         YDØT([1+5)+YPRED([1+7)*(X1*SAVY(3)+X2*SAVY(5))
-XN*X1RØ*YPRED([])-XN*YAMPT*X1RØSQ-K*XFPHLD-(EPSITH+
EPSIPH)*(X1*XFPHL1+X2*XFPHL2)+YPRED([1+7)*(X1*XFZEL1+
                                                                                                                                                                                                                                                                            YDØT(I+7) = (XK22*(YPRED(I+3)+K*XMTPH)-XC22*(YPRED(I+1)+K*XNTPH)
                                                                                                                                                           XFZELD)-(EPSITH+EPSIPH)*(X1*XFZEL1+X2*XFZEL2)-
YPRED(I+7)*(X1*XFPHL1+X2*XFPHL2)-X1R0*XN*(YANPT*
                                                                                                                                        -YANTH#XIRB+XNSQ*YAMTH*XIRBSQ+K*(XN*XMPHLD*XIRB-
                                                                                                                                                                                                                                 -2.0*XN*YAMPT*XIRB+YAJPH+K*XMTHLD
                     = XIRB*(XN*YPRED(I+4)~YPRED(I+6))
                                                                                                                  X2*XFZEL2)
                                                                                                                                                                                                                                                           YDØT(1+6)=YPRED(1+7)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   YASAVE(IY+7) = YAJPH
                                                                                                                                                                                                                                                                                                                                                                                                 YASAVE(IY+I) = YANTH
YASAVE(IY+I)=YAMTH
YASAVE(IY+Z)=YAMPT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                  YASAVE(IY+3)=YANP
                                                                                                                                                                                                                                                                                                                                                                           1+(1-H)+8= A1 5006
                                                                                                                                                                                                                                     YDØT([+3) =
                                                                                                                                          YDØT(1+2)
                                                                       -YDØT(I+1)
                                             EPSIPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       RETURN
```

SUBROUTINE EIGVAL

This is the controlling routine for the program eigenvalue calculation loop. The necessary matrices for the calculations are passed to COMPAK, and thence to routine EIGEN. The controlling routine EIGVAL will provide intermediate matrix print as desired.

Subroutine COMPAK: This routine reads rows of a two-dimensional array from a storage unit into core and then stores them into a column vector.



```
3400190
3400200
3400210
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3400080
3400090
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  3400000
                                          3400030
3400031
3400040
                                                                                                                                                                                                        3400140
                                                                                                                                                                                                                                 3400160
                                                                                                                                                                                                                                                                                                                                                        3400250
                                                                                                                                                                 3400110
                                                                                                                                                                                                                                                                                                                                           3400240
                                                                                 3400050
                                                                                              3400060
                                                                                                                                                                              3400120
                                                                                                                                                                                           3400130
                                                                                                                                                                                                                                                            FORMAT(1H1,- DEAD LOAD PRESTRESS OR BASE STIFFNESS MATRIX-)
.. ROUTINE ** EIGVAL ** ABACUS UPDATED 07/24/72 ....
SUBKBUTINE EIGVAL (CBNV, EIG,N, IBEGIN, QVEC)
DIMENSIBN A{8400},8(8300),Q(1024),QVEC(128,1)
REMIND 4
HEMIND 11
CALL CBMPAK (4,N,A)
CALL CBMPAK (11,N,B)
INDEX = (N*N+N)/2
IF (IBEGIN,EQ.0) GØ TØ 50
                                                                                                                                          FORMATION - LIVE LOAD PRESTRESS STIFFNESS MATRIX-)
U0 20 J=1,N
K = M+J-1
                                                                                                                                                                                                                                                                                                                                            00.10 J=1,1NDEX
10 A(J) = -(A(J)-B(J))
CALL EIGEN(N,A,B,CONV,Q,EIG,QVEC)
                                                                                                                                                                                           WRITE(6,22) J,(A(I),I=M,K)
FBRMAT(I5,IP8E15.6/(5x,IP8E15.6))
                                                                                                                                                                                                                                                                                                     WRITE(6,22) J, (B(I),1=M,K)
                                                                                                                                                                                                                                                                           DØ 30 J=1,N
                                                                                                                                        WRITE(6,21)
                                                                                                                                                                                                                                                  WR ITE (6,31)
                                                                                                                                                                                                                                                                                         K = M+J-1
                                                                                                                                                                                                                                                                                                                   30 M = K+1
50 CØNTINUE
                                                                                                                                                                                                                       M = K+1
                                                                                                                                                                                                                                                                                                                                                                                     RETURN
                                                                                                                         22
                                                                                                                                                                                                                                                                31
```

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C RBUTINE ** CBMPAK ** ABACUS UPDATED 05/20/72
SUBRBUTINE CBMPAK (NTAPE,IRBM,C)
DIMENSIBN C(1),x(128)
M = 1
DB 10 J=1,IRBW.
RAD(NTAPE) (X(1),I=1,IRBM)
DB 20 L=1,J
C(M) = X(L)
20 M = M+1
10 CBNTINUE
RETURN
END

SUBROUTINE EIGEN

EIGEN is the main eigenvalue and eigenvector calculation routine. Printout of the eigenvalues and appropriate eigenvectors is provided by this routine. First EIGEN prepares the matrices for eigenvalue extraction, calling FUTILE, DAGGER, and SWITCH. Then the matrices are passed to SYMEIG, which obtains the eigenvalues and specified vectors using the Householder technique.

Subroutine DAGGER: This routine performs the reduction of the two matrix eigenvalue problem to a standard eigenvalue problem.

Subroutine SYMEIG (Alternate entry point SYMVEC): This routine obtains the eigenvalues and vectors of a real, symmetric, matrix.

Subroutine TFORM: This routine performs the Householder similarity reduction of a real, symmetric matrix to tri-diagonal form.

Subroutine STURM: Performs the Sturm-sequence calculations of eigenvalues of a real, symmetric, tri-diagonal matrix.

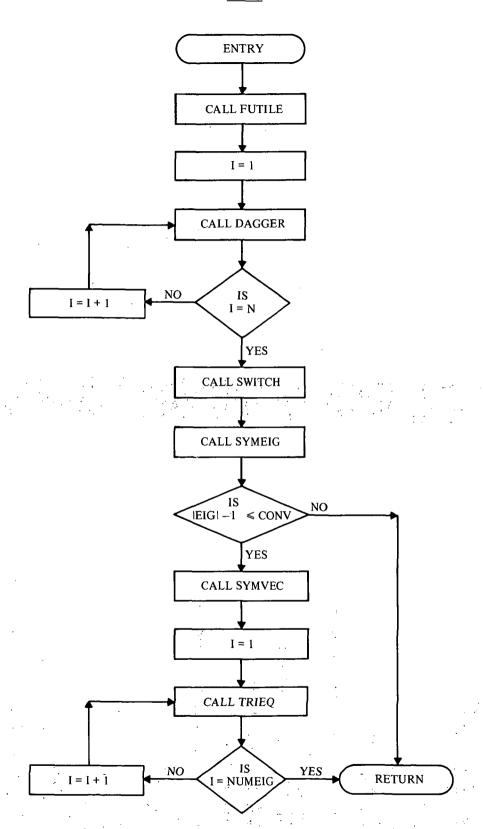
Subroutine PREP (alternate entry point DET): Determines the number of roots greater or equal to a stipulated value.

Subroutine QSVEC (alternate entry point QWIEL): Obtains eigenvectors of a tri-diagonal matrix and back transforms them to eigenvectors of the original real, symmetric matrix.

Subroutine RANDOM: Random number generator. This subroutine is an MSFC system subroutine and the listing is not included here. Most any random number generator may be substituted or the argument may be set to zero.

Subroutine ANDD: This routine "ands" or "ors" the corresponding bits of two given variables with each other.

Subroutine DOTPRO: Performs inner product accumulation using labeled common area INFO.



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3600790
3600800
3600810
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3600750
3600760
3600780
                                                                                                                                          3600720
                                                                                        3600670
                                                                                                                                                                                                        D 0 50 [=1,NUMEIG

READ(4)(Q(J),J=1,N)

CALL TRIEQ (A,Q)

WRITE(6,57)I,(Q(IJ),IJ=1,N)

57 FØRMAT(//- EIGENVECTØR-,I4/(IP8E15.6))

100 AVEC(IJ,I)=Q(IJ)

50 CØNTINUE

99 RETURN
                       EIG = C(1)

IF (ABS(ABS(EIG)-1.0).GT.CØNV) GØ TØ 99

NUMEIG=2

DØ 30 | 11,NUMEIG

CALL SYMVEC (A(INDEX),I,1,N)

IN=INDEX1+N

WRITE(4)(A(IND),IND=INDEX,IN)
                                                                                                                                                                                KEAD(4) (A(J), J=10FF, J2)
10FF=10FF+1
EIGENVALUES ARE IN Q
                                                                                                                                                        UB 40 I=1,N
J2=IBFF+I-1
                                                                                                                    30 CØNTINUE
                                                                                                                                REWIND 4
                                                                                                                                            10FF=1
                                                                                                                                                                                               40
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```

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C ..... RØUTINE ** DAGGER ** ABACUS UPDATED 07/19/72 ..... SUBRØUTINE DAGGER(A,M,P,KO,Q)
                                                                                                                                                                             SUM = SUM + A(LJ)*P(J)
                                                                                                                                                                                                        IF (K - L) 100,120,100
                                                                                                                                                                                                                                                              SUM = SUM + A(LJ) #P(J)
                                                                                                                                                                                                                                                                                                                                             DØ 140 I = 1,K
SUM = SUM + P(I)*Q(I)
                                         EQUIVALENCE (SUN, SUM
                                                                                                                                                                                                                                                                                                      INDEX = INDEX +
                                                                                                                                                                                                                                                                           110 LJ = LJ + J
120 0(I-1) = SUN
                                                                                                                                                                                            [] = [] + ]
                                                                                                                                                                                                                                                                                                                                                                                                                                          JL = LL+L-K
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        190 A(LL) = SUM
200 CØNTINUE
                                                     K = K0
K1 = K + 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  SUM = SUM
                                                                                                                                                                                                                                                                                                                                                                                                                                                       SUM = 0.
                                                                                                                                                    SUM = 0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   RE TURN
END
                                                                                                                                                                                                                                                                                                                                                                                                                                                                   081 00
                                                                                                                           CØ 130
                                                                                                          INDEX
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11
                                                                                                                                                                                                                     100 1
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3800000
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                                                                                                                                                                                MEANING OF THE PARAMETERS.

A - THE TRIANGULAR ARRAY CONTAINING THE MATRIX. DURING EXEC-
CUTION THE ARRAY IS CHANGED.
                                                                                                                                                                                                                                                                                                                                                                                           REAL ARRAY FOR THE ROOTS AND WORKING STORAGE. R MUST CON-
                 SUBRBUTINE SYMEIG(A.M.INDEX,NUMBR,R.TBL)
MASTER RØUTINE FØR EIGENVALUES AND (ØPTIØNALLY) EIGENVECTØRS ØF A
REAL SYMMETRIC MATRIX STØRED TRINGULARLY IN CØRE. THE HØUSEHØLDER
REDUCTIØN TØ TRIDIAGØNAL FØRM (SUBRØUTINE TFØRM) IS FØLLØMED BY A
BISECTIØN TECHNIQUE (SUBRØUTINE STURM) FØR THE RØØTS AND THEN IN-
                                                                                                                                                                                                                                                                                                                                                                                                                TAIN AT LEAST 8*M WORDS AND START ON A D.P. BOUNDARY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                      - TØLERANCE. IF B IS THE MAG. OF LARGEST ROOT, THE ROOTS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   CALL STURM(M, INDEX, NUMBR, R(LD), R(LB), R(LS), R(LP), R, EPS)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       WILL USUALLY HAVE ERRORS AS LARGE AS BATOL.
 SYMEIG ** ABACUS UPDATED 05/20/72 ....
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                DIMENSION X(MID,1)
CALL GSVEC(A,R(LD),R(L0),R(LD),R(LQ),R(LR),R(LS),M)
                                                                                                                      VERSE LIERATION (SUBROUTINE TRIVEC) FOR THE VECTORS.
                                                                                                                                                                                                                                                                                                            INDEX OF FIRST EIGENVALUE REQUIRED.
                                                                                                                                                                                                                                                                                                                                                    NUMBER OF EIGENVALUES REQUIRED.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             CALL TFORM(A,M,R(LD),R(LB),R(LS),R(LP))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           ENTRY SYMVEC(X, LØM, KØUNT, MID)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     = AMINI(RØØT-EPS,R(K))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              EPS = AMINI(TØL, 1.E-3)
                                                                                                                                                                                                                                                                    BRDER BF A.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  I. = 1, KBUNT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DIMENSION A(1), R(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          = R00T * 3.E-7
RØUTINE **
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          RETURN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ROOT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     RBBT
                                                                                                                                                                                                                                                                                                              INDEX
                                                                                                                                                                                                                                                                                                                                                    NUMBR
                                                                                                                                                                                                                                                                                                                                                                                                                                                        TOL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             200
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```
DØ 220 I = KPI,N

RHØ = 0((!)

TAU = 0(!)

13 = 11

II = 11 + NI

NI = NI - 1

DØ 220 J = [,N

A(IJ) = A(IJ) + RHØ*Ø(J) + TAU*D(J)

220 IJ = IJ + 1

230 D(K+I) = A(KRI)

P(N) = AKKPI)

S(N) = AMMNI(BL,D(N)-KHØ)

RETURN

END
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4000010
4000020
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4000040
4000050
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IF (ABS(RØØT - RUTE) - TØL) 300,300,8
CALL DET (N,D,SEC,RØØT,LØRD)
                                                                                              TOL = TOL * AMAXI(1.E-15,EPS)
DO 2 I = LIM1,LIM2
                                                                          IF (N1) 16,200,200
200 TØL = AMAX1(-BL,BU)
                                                                                          DFFD(N) = TOL
                                                                                                                SIGMA(I) =
                                                                                                                                                                                                                                                                                            CONTINUE
                                                                                                                                                                                                                                                                                                                   91
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4100030
4100040
4100050
4100000
                         4100020
  P ** ABACUS UPDATED 05/20/72 .....
N,D,SEC,RØØT,LØRD)
                                      QUIVALENCE (RD2, RE2), (RD4, RE4)
                                                                                                                                                                                                                                                                                                    200 RETURN
                                                                                                                                                                                                                                                                              160 LBW
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4200250
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       j
** ABACUS UPDATED 05/20/72
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              (ABS(P(N)) .LT. TØL) P(N) = TØL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           RIGHT SIDE MODIFICATION.
                                                                                                                                                                                                                                                                                                                              TOL = (TOL + 1.E-15) * 1.E-15
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            CALL ANDO (S(I); FLAG, S(I), 0)
P(I+1) = P(I+1) - S(I)*Q(I)
                                                                                                                                                                                                                                                                                                                                                                                                         IF (T + U - TEL) 110,120,120
                                                                                                                                                                                                                                                                                                                                                   PART 2. MATRIX DECOMPOSITION.
                                                                                                                                                                                                                                                                                             TOL = AMAXI(TOL, ABS(D(I)))
                                                                                                                                                                                                                                                                                                                                                                                                                                                130 S(I) = P(I)/ØFFD(I)
CALL ANDD (S(I),1,S(I),1)
TEMP = Q(I)
P(I) = ØFFD(I)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   P(I+1) = 1EMP - S(I)*Q(I)
                                                                                                                    UATA FLAG/0777777777776/
                                                                                                                                                                                                                                                                                                                                                                                                                                     120 IF (T - U) 130,140,140
                                                                                                                                                                                   NI = N - 1
N2 = N - 2
RETURN
ENTRY OWIEL (RØØI,X)
                                                                                                                                         PARI 1. PRELIMINARIES.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                S(1) = &FFD(1)/P(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             0(1+1) = -5(1)*R(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 170 ASSIGN 330 TØ KØUNT
RBUTINE ** QSVEC
                                                                                                                                                                                                                             ASSIGN 170 TØ KØUNT
                                                                                                                                                                                                                                      TOL = 0.

UB 100 I = 1,N

P(I) = D(I) - ROBT
                                                                                                                                                                                                                                                                                                                                                                                              U = ABS (ØFFD(I))
                                                                                                                                                                                                                                                                                                         CALL RANDOM (XX)
                                                                                                                                                                                                                                                                                                                                                                         1.00 150 I = 1, NI
                                                                                                                                                                                                                                                                      0(1) = 0FFD(1)
                                                                                                                                                                                                                                                                                                                                                                                  T = ABS (P(1))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               0(1) = b(1+1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         R(1) = 0(1+1)
                                                                                                                                                                                                                                                                                                                                                                                                                  110 P(1) = 10L

T = P(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GØ TØ 150
                                                                                                                                                                                                                                                                                     K(I) = 0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             PART 3.
                                                                                                                                                               ×
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220 \times (K) = (\times(K) - 0(K) * \times (K+1) - R(K) * \times (K+2)) / P(K)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            C PARI 6. TRANSFORMATION BY ORTHOGONAL MATRICES.
                                                                                                                                                                                                                                 210 x(N) = x(N)/P(N)

x(N1) = (x(N1) - Q(N1)*x(N)) / P(N1)

CB 220 I = 2,NI
                                                                                                                                                                                         PART 4. TRIANGULAR SYSTEM SOLUTION.
                                                                                                                                                                                                                                                                                                                                                 PART 5. SCALING TO UNIT VECTOR.
                                                                                                        58 T8 200
190 X(1+1) = X(1+1) - S(1)*X(I)
200 CBNINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        GB TB KBUNT, (170,330,370)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          X(J) = X(J) + SCALAR*A(IJ)
DØ 200 I = I,NI
CALL ANDD (S(I),1,TEMP,0)
IF (TEMP) 180,190,180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              CALL DOTPRO (XINI), AIL))
                                                    T = X(I)

X(I) = X(I+1)

X(I+1) = T - S(I) * X(I)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                ASSIGN 370 TØ KØUNT
GØ TØ 230
°370 RETURN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 330 L = (N#(N+1))/2 - 4
                                                                                                                                                                                                                                                                                                                                                                                                                         CALL DOTPRO (X,X)
SCALAR = DSQRT(SUM)
DØ 250 I = 1,N
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    SCALAR = A(L-1) *SUM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      250 X(1) = X(1)/SCALAR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   1) 8 360 I = 1, N2
NI = N - I
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      00 350 J=NI,N
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            350 1J = IJ + 1
360 L = L - I -
                                                                                                                                                                                                                                                                                                                                                                                     230 SUM = 0.00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          SUM = 0.00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                W = 1 + 1
                                                                                                                                                                                                                                                                                             1
2
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اا
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4200850

4200870 4200880 4200890

4200640 4200650 4200660 4200670 4200680 4200690

4200710 4200720 4200730

4200740 4200750 4200760

4200770

4200790 4200800

4200791

4200610

4200600

4200630

4200580

4200910 4200911 4200920

4200900

4200930 4200940 4200950

4200960

4200970 4200980 4200990 4201000

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SUBRBUTINE ANDD (X,Y,Z,IFLAG)
LØGICAL UND,JA,NEIN
REAL NØ
EQUIVALENCE (UND,E),(JA,SI),(NEIN,NØ)
1 SI = X
NØ = Y
UND = JA.AND.NEIN
I C. (IFLAG.EQ.I) UND = JA.ØR.NEIN
L = E
RETURN
END
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C KBUTINE ** DØTPRØ ** ABACUS UPDATED 05/20/72
SUBREUTINE DØTPRØ (x,y)
DIMENSIEN X(1)*Y(1)
BURDEE PRECISIEN S
COMMON INFO S N. 11x, 1Y ...
[F (N) 12c,12c,10c)
10c JX = 1
JY = 1
DO JX = 1
DO 11c J = 1,N
S = S + X(JX)*Y(JY)
JX = JX + IX
110 JY = JY + IY
12c = ETURN
END

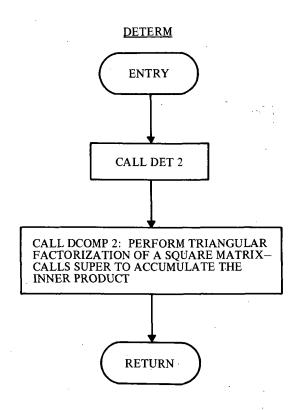
SUBROUTINE DETERM

This is the controlling routine for the program determinant evaluation loop. The matrix in question is passed to DET2 where the determinant evaluation calculations occur.

Subroutine DET2: This routine computes the determinant of a square matrix. The actual determinant value is normalized to ± 1 .

Subroutine DCOMP2: This routine performs the triangular factorization of a square matrix.

Subroutine SUPER: This routine performs inner product accumulation.



SUBROUTINE DETERM (NZ, MDET)
DIMENSION A(128,128),T(256)
REWIND 4
DØ 187 121,NZ
187 READ(4) (A(1,J),J=1,NZ)
CALL DETZ (A,NZ,128,T,NU,D)
WRITE(6,80) D
BO FBRMI(///20x,-DETERMINANT =-,F5.1)
REWIND 4
RETURN
END

SUBRBUTINE DET2 (A, M, MID, T, NU, D)

DETERMINANT OF A SPARSE IN-CORE REAL MATRIX, WITH PROTECTION AGAINST OVERLOW AND UNDERFLOW. DETERMINANT IS GIVEN IN A SPECIAL FORM TO ALLOW REPRESENTATION OF VERY LARGE OR SMALL VALUES.

HIL

FORTRAN DOUBLE ARRAY CONTAINING THE MATRIX.

FIRST DIMENSION OF ARRAY A, I.E. MAX. NO. OF ROWS. BRDER BF MATRIX A, I.E. ACTUAL NUMBER BF RBWS. O W

MORKING STORAGE ARRAY OF AT LEAST 2*M REAL NOS.

DETERMINANT IS GIVEN AS (16**NU) * D. NO, D

DIMENSION A(1), T(1)
EQUIVALENCE (P,IP)
CALL DCOMP2 (A, M, MID, T, T(M+1), NIX)
NU = 0 IF (NIX) 100,110,120

M(01 = M10 + GØ TØ 130 0 = -1.DØ 140 120

CONTINUE CONTINUE 150 D = -D 140 CØNTINUE 999 CØNTINUE RETURN

IF (A(II)) 150,140,140

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COLUMN K OF A IS USED TO PRODUCE COLUMN K OF L AND
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    IS MADE IN SUPPRESS TRIVIAL OPERATIONS BY SKIPPING THE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            SUPER DRES THE INNER
                                                                                                                                                                                                                                                                                                                                                                                                                                    110 LEAD(1) = (1J - 1) / MID + 1
LEAD(1) IS THE COLUMN INDEX OF 1ST NON-ZERO ENTRY OF ROW I.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       LEADING ZERØ-IERMS IN EACH INNER PRØDUCT. SUPER DØES THE PRØDUCT ACCUMULATIØN AND IS AVAILABLE IN FØRTRAN AND (360)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        IF LOOP FALLS THROUGH, COLUMN K IS ZERO AND A IS SINGULAR.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               U. ABBVE DIAGBNAL, A ELEMENTS CONVERT TO U ELEMENTS, AF PIVOT SELECTION (USING PARTIAL PIVOTING WITH IMPLICIT ROW SCALING), THE U(K,K) AND L(I,K) ELEMENTS ARE COMPUTED. A
                                                                                                                                                                                                                                                                                                                                                               IF LOOP FALLS THROUGH, ROW I IS ZERO AND A IS SINGULAR.
                   INTEGER*2 LEAD
TRIANGULAR DECOMPUSITION OF A SPARSE IN-CORE MATRIX.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              FIRST K COLUMNS CONTAIN ALL ZEROS BELOW ROW LAST.
SUBRBUTINE DCBMP2(A,M,MID,LEAD,ENT,NIX)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ) 180 | = LØW, LAST
= AMAXI(G, ENT(I) * ABS(A(IK)))
                                                                                      DIMENSION A(1), LEAD(1), ENT(1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             LØSP CAN-T FALL THRØUGH.
LAST = MAXO(LAST, MP1-J)
                                                                                                                                                                                                                                                                                                                  IF (A(13)) 110,100,110
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            LASTK = KB + LAST - 1-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           (A(JK)) 170,160,170
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (A(JK)) 150,140,150
                                                                                                                                                                                                                                                                                          IJ = I, MM, MID
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       ASSEMBLY LANGUAGE.
                                                                                                                                                                                                                                                     OIM -
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               LOW = JK - KB + 1 ...
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         = KB, MK.
                                                                DAUBLE PRECISION S
                                                                                                                                     EQUIVALENCE (EL,L)
                                                                                                                                                                                                                                                                                                                                                                                           NIX = -(1000 + 1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            J = 1,M
                                                                                                                DATA MONE / -1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                G = ABS( A(KJ)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     JK = JK + MRNE
                                                                                                                                                                                                                           GIW # W # GIWW
                                                                                                                                                                                                                                                   MM = MMID + M
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ENT(1) = 16.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              MAJOR LOOP.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  310 K=1,M
                                                                                                                                                                                  = 1.E-6
                                                                                                                                                                                                        - + X ||
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      ATTEMPT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    866 01 00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            LOWK = JK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             LIMIT = 0
                                                                                                                                                                                                                                                                                                                                           100 CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       CONTINUE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       JK = 14K
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           UB 120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          08 180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            100 160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         LAST =
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                120
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          150
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          160
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   170
```

```
180 IK = IK + 1

TRL = G * EPS

IK = LBW

TRL = G * EPS

IK = LBW

TR = LBW

TR = 0.

DW 230 1 = LBW, LAST

LEAST = LEAG(I) + A(EB)* LEAST* LIMIT, MID, S)

CAL SUPER (A(I) + A(EB)* LEAST* LIMIT, MID, S)

A(IN) = 5 + A11K)

TF (IP = 0.

20 LIMIT = 1

20 LEMED = CBAIK)

L = I

20 LEMED = LEAD(I)

ENT(I) = ENT(K)

ENT(K) = G

C = ENT(I)

ENT(K) = G

C = ENT(K)

ENT(K) = G

C = EAD(I)

L = K + 1

L = K + 1

L = A(LJ)

A(KJ) = TRD

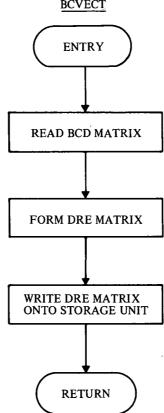
A(KJ) =
```

```
SUDROUTINE SUPER (X,Y,LEAST,LIMIT,MID,S)
LIMENSION X(1), Y(1)
LOUBLE PRECISION S
S = 0.000
If (LEAST - LIMIT) 100,100,120
IO 1X = (LEAST - 1) * MID + 1
DØ 110 I = LEAST,LIMIT
S = S + X(IX)*Y(I)
ILO (X = IX + MID
LOUBLE PRECISION S
S = S + X(IX)*Y(I)
LOUBLE PRECISION S
S = S + X(IX)*Y(I)
LOUBLE PRECISION S
S = NETURN
END
```

SUBROUTINE BCVECT

This routine converts the eigenvector obtained during a converged eigenvalue pass into the form accepted by INITAL. The calculations are identical to those in the latter part of STRMAT, and result in the DRE array.

Control of the Control



```
4600000
                                                                 4600030
4600040
4600050
4600050
                                                                                                                                                                                                                                                   4600140
4600150
4600160
                                                                                                                                                                                                                                                                                                            4600180
4600190
4600200
                                                                                                                                            4600070
                                                                                                                                                                          4600090
                                                                                                                                                                                                      4600110
                                                                                                                                                                                                                        4600120
                                                                                                                                                                                                                                       4600130
C/ ..... ROUTINE ** BCVECT ** ABACUS UPDATED 07/24/72 .....

SUBROUTINE BCVECT (NZ,QVEC,NØJS,JRTIC,JRSTØP,NREG)
DIMENSIEN QVEC(128,1),BCD(128,128),JRTIC(1),JRSTØP(1),DRE(128,2)
REMIND 3
REMIND 14
NJTNH4 = 4*NØJS
READ(14,) (BCD(1,J),J=1,NZ),[=1,NJTNH4)
UØ 800 J=1,2
UØ 800 J=1,NJTNH4

DRE(JJ,L)=0.

DRE(JJ,L)=0.

DRE(JJ,L)=0.
                                                                                                                                                                                        00 0VE(1).1 = 0RE(1).L) + BCD(1,K) * QVEC(K,L)

00 71 NR=1, NREG

00 71 K=1, 2

11 = (JRTIC(NR)-1)*4+1

1F (K,EQ,2) II = JRST0P(NR)*4-3

1I = 11+3

00 71 1=11, III

1WRITE(3) (ORE(1,L),L=1,2)

KEWIND 3
                                                                                                                                                                                                                                                                                                                                 RETURN
                                                                                                                                                                                                                                                                                                     71
```

SUBROUTINE ETRAP

This is an error trap routine which can be called by the MAIN routine at various stages of program execution. If the indicator NIX is not equal to zero, MAIN will call ETRAP and indicate the proper message to be printed.

```
2300000
                                                                               2300030
                                                                                                            2300040
                                                                                                                                      2300050
                                                                                                                                                                     2300060
                                                                                                                                                                                            2300070
                                                                                                                                                                                                                      2300080
                                                                                                                                                                                                                                               2300090
                                                                                                                                                                                                                                                                            2300100
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       4X,-THE TYPE OF-MATERIAL PROPERTY TABLE FOR A SEGMENT CA
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Š
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         1 FORWAT(). 4x,-ONE OF THE MATERIAL PROPERTY TABLES CANNOT BE IDENTI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               3 FORMAT(/ 4X,-THE TYPE OF GEOMETRY OF A SEGMENT CANNOT BE IDENTIFIED AS ONE HANDLED BY THE PROGRAM.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        SEGMENT CANNOT BE IDENTIF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    BNLY BNE THERMAL LBAD PRBBLE
                                                                                                                                                                                       COMMON NST(30),NKL(30,NXMAT(20),SAVJTC(30),SAVSTP(30),JRTIC(30)
COMMON JRSTOP(30),NREG,NMPT,NRC,NSC,NIX,IERRØR,KGEØM,IGEØM,ISTTAB
COMMON KELVIN,IBEGIN,NPRØB,NSEG,NERRØR,Q,THICK,NØJS,NLINKS,NLCASE
COMMON NTSKL,NZ,NBCT,LINPUT,NTRKL,NPASS,XNI,KBC,NRINGS
DØUBLE PRECISIØN SAVTIC,TIC,PHI,STØP,RESTØP,RTICK
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                12 FURNATION 4x, THE RIEMAN VARIABLE, JEND, WHICH SIGNALS THE END BF
IA SEGMENT SHBULD BNLY BE ZERB BR NEGATIVE BNE, - /)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        2 FORMATI / 4x,-A MATERIAL PROPERTY TABLE NAME FOR A SEGMENT CANNOT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         11 FORMATI / 4x,-THE MAGIC CYCLE HAS GONE PAST STOP BY MORE THAN THE IPERMITTED VALUE. CHECK TO SEE IF FIXED STEP SIZE IS TOO LARGE.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  6 FORMATI / 4X,-THE TYPE OF TEMPERATURE INPUT FOR A SEGMENT CANNOT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           BLANK
                                                                                                                                                                                                                                                                                                                                                                                GØ TØ (8000,8036,8086,8087,8089,8090,8013,8009,8031,8008,8001,
8002,8003,8005,8007,8067,8101,8102,8103,8104,8105,8106,
8107,8108,8109,8110,8088,110,8120,8841,8842,8777,8797,
                                                                                                            CØMMØN STØRY(16),XMAT(110,10),STD(10),SADUS(30),RADUS(30)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        BE ZERB,
                                                                                                                                                                  COMMON XN, TEFREE, TIC, PHI, STOP, RESTOP, RTICK, G1, XNL(2), NH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           9 FORMAT(/ 4x,-THE LOAD INDICATOR CLUES CAN ONLY
** ABACUS UPDATED 07/07/72
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            16 IDENTIFIED AS THST, NOTH, THCN, OR THIN.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      INNØT BE IDENTIFIED AS ISØT, ØRTH, ØR STIF.-/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       . «
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      5 FBRMAT(/ 4X,-THE WALL CONSTRUCTION OF A
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  4X3-THE PROGRAM CAN EXECUTE
                                                                                                                                      COMMON TADUS (30), UADUS (30), SAVTIC (900)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  11ED AS SING, EQUA, UNEQ, ØR. BLAN.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  1BE FBUND IN THE TABLE LIST.-/)
                    SUBRBUTINE ETRAP
INTEGER SAVJTC, SAVSTP, Q, THICK
INTEGER XN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         IM PER DATA DECK .- /)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           8787), NERROR
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             1E. . BR, FBUR. - /)
  RBUTINE **D22"
                                                                                                                                                                                                                                                                                                                                     WRITE(6,1726)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        8008 WRITE(6,10)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    8001 WRITE(6,11)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            8002, WRITE(6, 12)
                                                                                                                                                                                                                                                                                                                                                            FØRMAT(1H1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       8087 WRITE(6,4)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 8031 WRITE(6,9)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       8000 WRITE(6,1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 8036 WRITE(6,2)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           8086 WRITE(6,3)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   8090 WRITE(6,6)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              8089 WRITE(6,5)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           8013 GB TB 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    8009 GØ TØ, 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    10 FORMAT(/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              8003 GB TB 505
8006 GB TB 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     GØ TØ 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 4 FORMATI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       3 FORMAT (/
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8841 KRITE(6,30)
30 FORMATI/ 4X,-IN THE COMPUTATION OF THE REGION STIFFNESSES, THE K2
12 MATRIX WAS NOT POSITIVE DEFINITE,-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     27 FORMATI/ 4x,-THE PROGRAM CANNOT DETERMINE WHETHER THE PROBLEM INP 1UT IS THIC, RWAF, RWAI, RWAZ, RWA3, STIO, STII, STIZ, STI3, ISG1, 21SG2, OR ISG3.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  31 FORMATI / 4x,-IN THE COMPUTATION OF THE REGION LOADS, THE K22 MATR 11X WAS NOT POSITIVE DEFINITE.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                8777 WRITE(6,32)
32 FØRMAT(/ 4x,-IN THE CØMPUTATIØN ØF THE REDUCED FLEXIBILITY MATRIX
1, THE REDUCED STIFFNESS MATRIX IS SINGULAR.-/)
                            15 FØRMAT(/ 4X,-THE INTERPØLATED VALUE ØR TEMPERATURE FØR THE MATERI
1AL PRØPERTY TABLE IS LESS THAN THE SECØND TEMPERATURE VALUE.-/)
                                                                                                                                                16 FØRMATI/ 4X,-THE INTERPOLATED VALUE OF TEMPERATURE FOR THE MATERI IAL PROPERTY TABLE IS GREATER THAN THE LAST VALUE OF TEMPERATURE.-
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              29 FØRMAT(/ 4X,-THE Y2 BLØCK IN THE SEGMENT MAGIC ØUTPUT IS SINGULAR
                                                                                                                                                                                                                                                                                                17 FORMATI / 4X,-THE KII STIFFNESS PARAMETER IS ZERO.-/)
                                                                                                                                                                                                                                                                                                                                                                                 18 FØRMAT() 4X,-THE K12 STIFFNESS PARAMETER IS ZER0.-/)
GØ TØ 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               19 FURMAT(/ 4X,-THE K21 STIFFNESS PARAMETER IS ZERØ.-/)
GØ TØ 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      4X,-THE K22 STIFFNESS PARAMETER IS ZERB.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 8105 WRITE(6,21)
21 FØRMAT(/ 4X,-THE K33 STIFFNESS PARAMETER IS 2ERØ.-/)
GØ TØ 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 23 FORMATI/ 4X,-THE DI2 STIFFNESS PARAMETER IS ZERG.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 24 FØRMAII/ 4X,-THE D21 STIFFNESS PARAMETER IS ZERØ.-/)
GØ TØ 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         4x,-THE D22 STIFFNESS PARAMETER IS ZER0.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           FORMAT(/ 4X,-THE DII STIFFNESS PARAMETER IS ZERO.-/)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   4x,-THE D33 STIFFNESS PARAMETER IS ZERB.-/
                                                                                                     8067 WRITE(6,16)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    8110 WRITE(6,26)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         8842 WRITE(6,31)
                                                                                                                                                                                                                                                                                                                                                                                                                                                        8103 WRITE(6,19)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             8109 WRITE(6,25)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  110 GB TB 505
8120 WRITE(6,29)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             8104 WRITE(6,20)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   8107 WRITE(6;23)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           8108 WRÎTE(6,24)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 8088 WRITE(6,27)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            8106 WRITE(6,22)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      8797 WRITE(6,33)
8007 WRITE(6,15)
                                                                                                                                                                                                                                                                         8101 WRITE(6,17)
                                                                                                                                                                                                                                                                                                                                                        8102 WRITE(6,18)
                                                                                                                                                                                                                                                                                                                               GØ TØ 505
                                                                                                                                                                                                                                             GØ TØ 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         20 FBRMAT(/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 25 FORMAT(/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               CØ TØ 505
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         26 FORMAT(/
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           . 22
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33 FORMAI(/ 4X,-FØR KINEMATIC LINKS BETWEEN SEGMENTS, THE DEPENDENT 1JØINT NUMBER WUST BE GREATER THAN THE INDEPENDENT JØINT NUMBER.-/)
GØ TØ 505
8787 WRITE(6,34)
34 FØRMAI(/ 4X,-THE NUMBER ØF PØINTS IN THE ST TABLE MUST BE BETWEEN
1 2 AND 30.-/)
505 RETURN
END

REFERENCES

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